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UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

ILLUMINA, INC. and ILLUMINA CAMBRIDGE LTD., Plaintiffs, v. BGI GENOMICS CO., LTD., BGI AMERICAS CORP, MGI TECH CO., LTD., MGI AMERICAS INC., and COMPLETE GENOMICS INC., Defendants.	Case No.: 19-cv-03770-WHO **DEFENDANTS' ANSWER TO ILLUMINA'S FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT AND COUNTERCLAIM FOR PATENT INFRINGEMENT** **DEMAND FOR JURY TRIAL**

Defendants[1] BGI Americas Corp. ("BGI Americas"), MGI Tech Co., Ltd. ("MGI Tech"), MGI Americas Inc. ("MGI Americas"), and Complete Genomics, Inc. ("CGI") (collectively, "Defendants"),[2] through their undersigned counsel, hereby demand a jury trial and answers Plaintiffs Illumina, Inc. and Illumina Cambridge Ltd.'s (collectively, "Illumina" or "Plaintiffs") First Amended Complaint, D.N. 52, (the "First Amended Complaint") as follows:

INTRODUCTION

1. Defendants admit that BGI Genomics and MGI Tech are headquartered in Shenzhen, China. Defendants deny any remaining allegations of Paragraph 1 of the First Amended Complaint.

2. Defendants admit that a preliminary injunction was granted in *Illumina, Inc. v. Qiagen*, *NV*, 207 F. Supp.3d 1081 (N.D. Cal. 2016). Defendants further admit that certain claims of the '537 Patent were not invalidated in *Intelligent Bio-Systems v. Illumina Cambridge*, 821 F.3d 1359 (Fed. Cir. 2016). Defendants deny any remaining allegations of Paragraph 2 of the First Amended Complaint.

3. Defendants admit that CGI filed two Petitions to institute *inter partes* review ("IPR") of several claims of the '537 Patent and that neither Petition was instituted. *Complete Genomics, Inc. v. Illumina Cambridge Ltd.*, IPR2017-02172, Paper 20 (PTAB Apr. 20, 2018) and IPR2017-02174, Paper 20 (PTAB Apr. 20, 2018). Defendants admit that CGI listed BGI Shenzhen Co., Ltd.; BGI Groups USA Inc.; BGI Genomics Co., Ltd.; and BGI Americas Corporation as real parties in interest in those Petitions and that MGI Tech and MGI Americas were not identified as real parties in interest. Defendants deny any remaining allegations of Paragraph 3 of the First Amended Complaint.

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[1] At the time of this filing, Defendant BGI Genomics, Co. Ltd. ("BGI Genomics") has not been served with Illumina's Complaint or Amended Complaint. Nothing herein shall be considered a response by BGI Genomics. With respect to any response contained herein that is directed to alleged activities or knowledge of BGI Genomics, such response is based on the information and belief of the responding Defendants only.

[2] Illumina refers to the Defendants with alternative short-hand names that are inconsistent with ordinary corporate practice. Thus, those short-hand names are not used herein.

4. Paragraph 4 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that they have installed and operated certain BGISEQ and MGISEQ sequencers at their San Jose, California facility. Defendants deny any remaining allegations of Paragraph 4 of the First Amended Complaint.

5. Paragraph 5 of the First Amended Complaint contains opinions to which no response is required. To the extent that a response is deemed required, Defendants admit that they have a San Jose, California facility in this District. Defendants deny any remaining allegations of Paragraph 5 of the First Amended Complaint.

6. Paragraph 6 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 6 of the First Amended Complaint.

PARTIES

7. Defendants admit that, on information and belief, Plaintiff Illumina, Inc. is a Delaware corporation with its principal place of business at 5200 Illumina Way, San Diego, California 92122.

8. Defendants admit that, on information and belief, Plaintiff Illumina Cambridge Ltd. is a foreign corporation with its principal place of business at Chesterford Research Park, Little Chesterford, Saffron Walden, Essex CB10 1XL, United Kingdom.

9. Defendants lack sufficient information to admit or deny the allegations of Paragraph 9 of the First Amended Complaint, and on that basis, deny them.

10. Defendants admit that BGI Genomics is a Chinese corporation that has its headquarters at Building No. 7, BGI Park, No. 21 Hongan 3rd Street, Yantian District, Shenzhen 518083, China. Defendants deny any remaining allegations of Paragraph 10 of the First Amended Complaint.

11. Defendants deny the allegations of Paragraph 11 of the First Amended Complaint.

12. Defendants admit that MGI Tech is a Chinese corporation that has its headquarters at Building No.11, Beishan Industrial Zone, Yantian District, Shenzhen 518083, China. Defendants deny any remaining allegations of Paragraph 12 of the First Amended Complaint.

13. Defendants admit that MGI Americas has a principal place of business at 2904 Orchard Parkway, San Jose, California 95134. Defendants deny any remaining allegations of Paragraph 13 of the First Amended Complaint.

14. Defendants admit that CGI has a principal place of business at 2904 Orchard Parkway, San Jose, California 95134. Defendants deny any remaining allegations of Paragraph 14 of the First Amended Complaint.

15. Paragraph 15 contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 15 of the First Amended Complaint.

JURISDICTION AND VENUE

16. Defendants admit that this action arises under the Patent Laws of the United States of America and that this Court has federal question jurisdiction.

17. Defendants admit that, for the purposes of this action, venue is proper in this District. Defendants further admit that MGI Americas and CGI have a principal place of business at 2904 Orchard Parkway, San Jose, California 95134. Defendants deny any remaining allegations of Paragraph 17 of the First Amended Complaint.

18. Defendants admit that venue is proper in this District for the foreign Defendants. Defendants admit that Judge Alsup of this District had experience with the Plaintiffs' asserted patents, but he has stated that he "now remembers little about the patents." *See* D.N. 18. Defendants deny any remaining allegations of Paragraph 18 of the First Amended Complaint.

19. Paragraph 19 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that, for the purposes of this action, Defendants do not contest personal jurisdiction. Defendants deny any remaining allegations of Paragraph 19 of the First Amended Complaint.

20. Paragraph 20 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 20 of the First Amended Complaint.

a. Defendants admit that Ex. 5 of the First Amended Complaint depicts "Representative Offices" in San Francisco, Los Angeles, and San Diego, California and an "Office/Lab" in San Jose, California. Defendants deny any remaining allegations of Paragraph 20.a. of the First Amended Complaint.

b. Paragraph 20.b. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 20.b. of the First Amended Complaint.

c. Paragraph 20.c. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that BGI Genomics has had a presence at industry trade shows in California, including those listed in Paragraph 20.c. of the First Amended Complaint and that BGI Genomics' CEO, Ye Yin, presented at the J.P. Morgan Health Care Conference in January of 2018. Defendants deny any remaining allegations in Paragraph 20.c. of the First Amended Complaint.

d. Defendants admit that in March 2019, BGI Genomics entered into a $50 million partnership with Natera, Inc. Defendants deny any remaining allegations in Paragraph 20.d. of the First Amended Complaint.

21. Paragraph 21 of the First Amended Complaint requires no response.

a. Defendants admit that Ex. 12 of the First Amended Complaint identifies Yongwei Zhang as Group VP and CEO of BGI Americas Region at BGI Group. Defendants deny any remaining allegations in Paragraph 21.a. of the First Amended Complaint.

b. Defendants admit that Ex. 13 of the First Amended Complaint identifies Ke Zhan as a Director of Product Management at BGI Americas. Defendants deny any remaining allegations in Paragraph 21.b. of the First Amended Complaint.

c. Defendants admit that Ex. 14 of the First Amended Complaint identifies Yuhan Zhang as a resident in the San Francisco Bay Area and as having worked in San Jose, California. Defendants further admit that Ex. 14 of the First Amended Complaint states that Ms. Zhang "[i]dentified new business opportunities, reached out to potential partners and managed existed relationship through email campaign, framed contracts and MoU," and "[o]rganized and supported marketing events in North and South America to promote the brand and publicity."

22. Paragraph 22 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that, for purposes of this case, BGI Genomics has not contested personal jurisdiction, but that BGI has not been served, such that exercise of jurisdiction over BGI Genomics is improper at this time. *See* D.N. 27 and 42. Defendants deny any remaining allegations of Paragraph 22 of the First Amended Complaint.

23. Paragraph 23 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that BGI Americas is present in California. Defendants deny any remaining allegations of Paragraph 23 of the First Amended Complaint.

a. Defendants admit the allegations of Paragraph 23.a. of the First Amended Complaint.

b. Defendants deny the allegations of Paragraph 23.b. of the First Amended Complaint.

c. Paragraph 23.c. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that some employees of BGI Americas, including Johan Christiaanse, are located in this District. Defendants also admit that Yongwei

Zhang resides in this District. Defendants deny any remaining allegations of Paragraph 23.c. of the First Amended Complaint.

24. Paragraph 24 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that this Court has jurisdiction over BGI Americas. Defendants deny any remaining allegations of Paragraph 24 of the First Amended Complaint.

25. Paragraph 25 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 25 of the First Amended Complaint.

a. Defendants admit that a map on MGI Tech's website shows a San Jose, California facility that is a "Research Center" and a "Commercial and After-Sales Service Center." Defendants deny any remaining allegations of Paragraph 25.a. of the First Amended Complaint.

b. Paragraph 25.b. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that the MGI Americas' website, as reflected in Ex. 20 to the First Amended Complaint, states: "As the leading manufacturer and developer of BGI's proprietary NGS instrumentation, the global MGI organization provides comprehensive products and services for fully-automated, real-time, whole picture and lifelong genetic analysis in life science research." Defendants admit that NGS stands for "next generation sequencing." Defendants deny any remaining allegations of Paragraph 25.b. of the First Amended Complaint.

c. Paragraph 25.c. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that Duncan Yu presented at the J.P. Morgan Healthcare Conference in San Francisco, California in January of 2019. Defendants deny any remaining allegations of Paragraph 25.c. of the First Amended Complaint.

d. Defendants deny the allegations of Paragraph 25.d. of the First Amended Complaint.

e. Paragraph 25.e. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that MGI Tech is involved in the research, development and marketing of the accused products. Defendants deny any remaining allegations of Paragraph 25.e. of the First Amended Complaint.

f. Paragraph 25.f. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that MGI Tech's Chief Scientific Officer, Rade Drmanac, resides in this District. Defendants further admit that Jia Sophie Liu and Paul Lundquist reside in this District. Defendants deny any remaining allegations of Paragraph 25.f. of the First Amended Complaint.

26. Paragraph 26 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, for purposes of this case, Defendants do not contest that this Court has jurisdiction over MGI Tech. Defendants deny any remaining allegations of Paragraph 26 of the First Amended Complaint.

27. Paragraph 27 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that MGI Americas is present in California. Defendants deny any remaining allegations of Paragraph 27 of the First Amended Complaint.

a. Paragraph 27.a. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that the MGI Americas' website, as reflected in Ex. 20 of the First Amended Complaint, states: "As the leading manufacturer and developer of BGI's proprietary NGS instrumentation, the global MGI organization provides comprehensive products and services for fully-automated, real-time, whole picture and lifelong genetic analysis in life science research." Defendants admit that NGS

stands for "next generation sequencing." Defendants deny any remaining allegations of Paragraph 27.a. of the First Amended Complaint.

b. Paragraph 27.b. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that MGI Americas is involved in the research, development and marketing of the accused products. Defendants deny any remaining allegations of Paragraph 27.b. of the First Amended Complaint.

c. Defendants admit that Ex. 28 of the First Amended Complaint states that MGI Americas' field service engineer, Abigail Frank, "services NGS instruments and lab automated workstations at Complete Genomics in San Jose, as well as external customers throughout North and South America." Defendants deny any remaining allegations of Paragraph 27.c. of the First Amended Complaint.

28. Paragraph 28 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, for purposes of this case only, Defendants do not contest that this Court has jurisdiction over MGI Americas. Defendants deny any remaining allegations of Paragraph 28 of the First Amended Complaint.

29. Paragraph 29 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that CGI is present in California. Defendants deny any remaining allegations of Paragraph 29 of the First Amended Complaint.

a. Paragraph 29.a. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that CGI is involved in the research and development of the accused products. Defendants deny any remaining allegations of Paragraph 29.a. of the First Amended Complaint.

b. Paragraph 29.b. of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that according to Exs. 25 & 30-31 of the First Amended

Complaint, Suzanne Yakota, Shifeng Li, and Rade Drmanac's LinkedIn profiles state they reside in the San Francisco Bay Area. Defendants deny any remaining allegations of Paragraph 29.b. of the First Amended Complaint.

c. Defendants admit that, according to Ex. 32 of the First Amended Complaint, CGI Fluidics Systems Engineer, Wei Wang, states she ensures the proper installation qualification and operation qualification (IQ/OQ), and instrument performance verification (IPV) of NGS systems, such as the BGISEQ-500 in an ISO 17025 accredited and customer-oriented environment, and that Ms. Wang states she is responsible for creating and compiling comprehensive procedural documentation for NGS systems, for processes including IQ/OQ, IPV, troubleshooting, repairs, replacement parts, calibrations, and maintenance.

d. Defendants admit that Exs. 33-34 of the First Amended Complaint describe CGI job postings for a Senior Regional Sales Manager/Director and a Strategic Accounts Specialist/Manager/Director based in San Jose, California. Defendants further admit that, according to the job postings, the positions, inter alia, would: (i) provide a one touch-point for the global customers with the full MGI product portfolio; (ii) navigate orders through the customer purchasing process; and (iii) be responsible for leading regional sale activities for MGI's NGS Sequencing instruments, reagents, software or solutions in the designated region. Defendants deny any remaining allegations of Paragraph 29.d. of the First Amended Complaint.

30. Paragraph 30 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that this Court has jurisdiction over CGI. Defendants deny any remaining allegations of Paragraph 30 of the First Amended Complaint.

31. Paragraph 31 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 31 of the First Amended Complaint.

INTRA-DISTRICT ASSIGNMENT

32. Defendants admit that this action is properly assigned to any of the divisions in this District. Defendants deny any remaining allegations of Paragraph 32 of the First Amended Complaint.

BACKGROUND

Alleged Infringement of the '537 and '200 Patents by the MGISEQ and BGISEQ Systems

33. Defendants admit that the '537 Patent, entitled "Labelled Nucleotides" issued on July 28, 2009, and that the inventors named on the face of the '537 Patent are Shankar Balasubramanian, Colin Barnes, Xioahai Liu, John Milton, Harold Swerdlow, and Xioalin Wu. Defendants admit that a copy of the '537 Patent appears to be attached to the First Amended Complaint as Ex. 1. Defendants lack sufficient information to admit or deny the remaining allegations of Paragraph 33 of the First Amended Complaint, and on that basis, deny them.

34. Defendants admit that the '200 Patent, entitled "Labelled Nucleotides" issued on August 9, 2016, and that the inventors named on the face of the '200 Patent are Shankar Balasubramanian, Colin Barnes, Xioahai Liu, and John Milton. Defendants admit that a copy of the '537 Patent appears to be attached to the First Amended Complaint as Ex. 2. Defendants lack sufficient information to admit or deny the remaining allegations of Paragraph 34 of the First Amended Complaint, and on that basis, deny them.

35. Defendants admit that members of the BGI Group launched the BGISEQ-500 in October of 2015. Defendants admit that members of the BGI Group launched the BGISEQ-50 in November of 2016. Defendants admit that MGI Tech launched the MGISEQ-200 and the MGISEQ-2000 in October of 2017. Defendants admit that MGI Tech launched the MGISEQ-T7 in October of 2018. Defendants admit that the BGISEQ-500, BGISEQ-50, MGISEQ-200, MGISEQ-2000, and MGISEQ-T7 are identified on MGI Tech's website and product literature. Defendants admit that CGI contributed to the development of the BGISEQ-500. Defendants deny any remaining allegations of Paragraph 35 of the First Amended Complaint.

36. Defendants admit that Ex. 22 of the First Amended Complaint states that "[a]ccording to MGI CSO Rade Drmanac, the current sequencing chemistry relies on stepwise

sequencing-by-synthesis (SBS) where 3'-blocked nucleotides are labeled with cleavable fluorescent dyes, which leave behind a molecular 'scar' after they are removed. This chemistry is similar to that used by Illumina and others." Defendants deny any remaining allegations of Paragraph 36 of the Complaint.

37. Paragraph 37 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that a claim chart is attached to the First Amended Complaint as Ex. 3. To the extent Illumina seeks to incorporate Ex. 3 of the First Amended Complaint as an allegation, the allegations do not comply with Federal Rule of Civil Procedure 8(d), which requires that "each allegation must be simple, concise, and direct." Furthermore, the allegations in Ex. 3 of the First Amended Complaint are vague, ambiguous, and lacking specificity as Illumina has indicated that Ex. 3 of the First Amended Complaint is not intended to limit Illumina's right to modify the chart, and that the chart is "preliminary and exemplary." Defendants deny any remaining allegations of Paragraph 37 of the First Amended Complaint.

38. Paragraph 38 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that certain BGISEQ and MGISEQ sequencers have been used at the San Jose, California facility. Defendants deny any remaining allegations of Paragraph 38 of the First Amended Complaint.

39. Paragraph 39 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 39 of the First Amended Complaint.

40. Paragraph 40 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 40 of the First Amended Complaint.

41. Paragraph 41 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that a claim chart is attached to the First Amended Complaint as Ex. 4. To the extent Illumina seeks to incorporate Ex. 4 of the First Amended Complaint as an allegation, the allegations do not

comply with Federal Rule of Civil Procedure 8(d), which requires that "each allegation must be simple, concise, and direct." Furthermore, the allegations in Ex. 4 of the First Amended Complaint are vague, ambiguous, and lacking specificity as Illumina has indicated that Ex. 4 of the First Amended Complaint is not intended to limit Illumina's right to modify the chart, and that the chart is "preliminary and exemplary." Defendants deny any remaining allegations of Paragraph 41 of the First Amended Complaint.

42. Paragraph 42 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that certain BGISEQ and MGISEQ have been used by Complete Genomics at the San Jose, California facility. Defendants deny any remaining allegations of Paragraph 42 of the First Amended Complaint.

43. Paragraph 43 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 43 of the First Amended Complaint.

44. Paragraph 44 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 44 of the First Amended Complaint.

COUNT I

Alleged Infringement of U.S. Patent No. 7,566,537 ("'537 Patent)

45. Defendants repeat and reallege their answers to Paragraphs 1-44 of the First Amended Complaint as if fully set forth herein.

46. Paragraph 46 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 46 of the First Amended Complaint.

BGI Genomics' Alleged Infringement of the '537 Patent

47. Paragraph 47 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that

BGI Genomics has had knowledge of the '537 Patent since at least October 5, 2017. Defendants deny any remaining allegations of Paragraph 47 of the First Amended Complaint.

48. Paragraph 48 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 48 of the First Amended Complaint.

Alleged Direct Infringement by BGI Genomics

49. Paragraph 49 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 49 of the First Amended Complaint.

50. Paragraph 50 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that CGI contributed to the development of the BGISEQ-500. Defendants deny any remaining allegations of Paragraph 50 of the First Amended Complaint.

51. Paragraph 51 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that Ex. 5 of the First Amended Complaint depicts "Representative Offices" in San Francisco, Los Angeles, and San Diego, California and an "Office/Lab" in San Jose, California, and that CGI identified BGI Genomics as a real-party-in-interest in IPR proceedings directed to the '537 Patent. Defendants deny any remaining allegations of Paragraph 51 of the First Amended Complaint.

52. Paragraph 52 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that BGI Genomics has had a presence at industry trade shows in California, including those listed in Paragraph 52 of the First Amended Complaint and that BGI Genomics' CEO, Ye Yin, presented at the J.P. Morgan Health Care Conference in January of 2018. Defendants deny any remaining allegations of Paragraph 52 of the First Amended Complaint.

Alleged Induced Infringement by BGI Genomics

53. Paragraph 53 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 53 of the First Amended Complaint.

54. Paragraph 54 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 54 of the First Amended Complaint.

55. Paragraph 55 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 55 of the First Amended Complaint.

56. Paragraph 56 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 56 of the First Amended Complaint.

57. Paragraph 57 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 57 of the First Amended Complaint.

58. Paragraph 58 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 58 of the First Amended Complaint.

59. Paragraph 59 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 59 of the First Amended Complaint.

60. Paragraph 60 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 60 of the First Amended Complaint.

Alleged Contributory Infringement by BGI Genomics

61. Paragraph 61 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 61 of the First Amended Complaint.

62. Paragraph 62 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 62 of the First Amended Complaint.

Alleged Willful Infringement by BGI Genomics

63. Paragraph 63 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 63 of the First Amended Complaint.

64. Paragraph 64 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 64 of the First Amended Complaint.

65. Paragraph 65 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 65 of the First Amended Complaint.

BGI Americas' Alleged Infringement of the '537 Patent

66. Paragraph 66 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that BGI Americas has had knowledge of the '537 Patent since at least October 5, 2017. Defendants deny any remaining allegations of Paragraph 66 of the First Amended Complaint.

Alleged Direct Infringement by BGI Americas

67. Paragraph 67 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 67 of the First Amended Complaint.

Alleged Induced Infringement by BGI Americas

68. Paragraph 68 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 68 of the First Amended Complaint.

69. Paragraph 69 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 69 of the First Amended Complaint.

70. Paragraph 70 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 70 of the First Amended Complaint.

71. Paragraph 71 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 71 of the First Amended Complaint.

72. Paragraph 72 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 72 of the First Amended Complaint.

73. Paragraph 73 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 73 of the First Amended Complaint.

Alleged Contributory Infringement by BGI Americas

74. Paragraph 74 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 74 of the First Amended Complaint.

75. Paragraph 75 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 75 of the First Amended Complaint.

Alleged Willful Infringement by BGI Americas

76. Paragraph 76 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 76 of the First Amended Complaint.

77. Paragraph 77 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 77 of the First Amended Complaint.

78. Paragraph 78 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 78 of the First Amended Complaint.

MGI Tech's Alleged Infringement of the '537 Patent

79. Paragraph 79 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 79 of the First Amended Complaint.

Alleged Direct Infringement by MGI Tech

80. Paragraph 80 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 80 of the First Amended Complaint.

Alleged Induced Infringement by MGI Tech

81. Paragraph 81 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 81 of the First Amended Complaint.

82. Paragraph 82 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 82 of the First Amended Complaint.

83. Paragraph 83 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 83 of the First Amended Complaint.[3]

84. Paragraph 84 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 84 of the First Amended Complaint.

85. Paragraph 85 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 85 of the First Amended Complaint.

86. Paragraph 86 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 86 of the First Amended Complaint.

87. Paragraph 87 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 87 of the First Amended Complaint.

Alleged Contributory Infringement by MGI Tech

88. Paragraph 88 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 88 of the First Amended Complaint.

89. Paragraph 89 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 89 of the First Amended Complaint.

[3] Defendants note that there is an un-numbered paragraph appearing after Paragraph 83 of Illumina's First Amended Complaint. *See* D.N. 52 at 26:4-11. This un-numbered paragraph of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of this paragraph.

Alleged Willful Infringement by MGI Tech

90. Paragraph 90 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 90 of the First Amended Complaint.

91. Paragraph 91 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 91 of the First Amended Complaint.

92. Paragraph 92 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 92 of the First Amended Complaint.

MGI Americas' Alleged Infringement of the '537 Patent

93. Paragraph 93 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 93 of the First Amended Complaint.

Alleged Direct Infringement by MGI Americas

94. Paragraph 94 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that MGI Americas has used certain BGISEQ and MGISEQ sequencers at their San Jose, California facility. Defendants deny any remaining allegations of Paragraph 94 of the First Amended Complaint.

Alleged Induced Infringement by MGI Americas

95. Paragraph 95 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 95 of the First Amended Complaint.

96. Paragraph 96 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 96 of the First Amended Complaint.

97. Paragraph 97 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 97 of the First Amended Complaint.

98. Paragraph 98 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 98 of the First Amended Complaint.

99. Paragraph 99 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 99 of the First Amended Complaint.

100. Paragraph 100 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 100 of the First Amended Complaint.

101. Paragraph 101 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 101 of the First Amended Complaint.

102. Paragraph 102 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 102 of the First Amended Complaint.

Alleged Contributory Infringement by MGI Americas

103. Paragraph 103 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 103 of the First Amended Complaint.

104. Paragraph 104 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 104 of the First Amended Complaint.

Alleged Willful Infringement by MGI Americas

105. Paragraph 105 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 105 of the First Amended Complaint.

106. Paragraph 106 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 106 of the First Amended Complaint.

107. Paragraph 107 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 107 of the First Amended Complaint.

CGI's Alleged Infringement of the '537 Patent

108. Paragraph 108 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 108 of the First Amended Complaint.

Alleged Direct Infringement by CGI

109. Paragraph 109 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that CGI has used certain BGISEQ and MGISEQ sequencers at its San Jose, California facility. Defendants deny any remaining allegations of Paragraph 109 of the First Amended Complaint.

Alleged Induced Infringement by CGI

110. Paragraph 110 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 110 of the First Amended Complaint.

111. Paragraph 111 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 111 of the First Amended Complaint.

112. Paragraph 112 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 112 of the First Amended Complaint.

113. Paragraph 113 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 113 of the First Amended Complaint.

114. Paragraph 114 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 114 of the First Amended Complaint.

115. Paragraph 115 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 115 of the First Amended Complaint.

116. Paragraph 116 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 116 of the First Amended Complaint.

117. Paragraph 117 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 117 of the First Amended Complaint.

Alleged Contributory Infringement by CGI

118. Paragraph 118 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 118 of the First Amended Complaint.

119. Paragraph 119 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 119 of the First Amended Complaint.

Alleged Willful Infringement by CGI

120. Paragraph 120 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants

admit that CGI has had knowledge of the '537 Patent since at least October 5, 2017. Defendants deny any remaining allegations of Paragraph 120 of the First Amended Complaint.

121. Paragraph 121 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 121 of the First Amended Complaint.

122. Paragraph 122 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 122 of the First Amended Complaint.

COUNT II

Alleged Infringement of U.S. Patent No. 9,410,200 ("'200 Patent)

123. Defendants repeat and reallege their answers to Paragraphs 1-122 of the First Amended Complaint as if fully set forth herein.

124. Paragraph 124 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 124 of the First Amended Complaint.

BGI Genomics' Alleged Infringement of the '200 Patent

125. Paragraph 125 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 125 of the First Amended Complaint.

126. Paragraph 126 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 126 of the First Amended Complaint.

Alleged Direct Infringement by BGI Genomics

127. Paragraph 127 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 127 of the First Amended Complaint.

128. Paragraph 128 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants

admit that CGI contributed to the development of the BGISEQ-500. Defendants deny any remaining allegations of Paragraph 128 of the First Amended Complaint.

129. Paragraph 129 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that Ex. 5 of the First Amended Complaint depicts "Representative Offices" in San Francisco, Los Angeles, and San Diego, California and an "Office/Lab" in San Jose, California, and that CGI identified BGI Genomics as a real-party-in-interest in IPR proceedings directed to the '537 Patent. Defendants deny any remaining allegations of Paragraph 129 of the First Amended Complaint.

130. Paragraph 130 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that Defendants admit that BGI Genomics has had a presence at industry trade shows in California, including those listed in Paragraph 130 of the First Amended Complaint and that BGI Genomics' CEO, Ye Yin, presented at the J.P. Morgan Health Care Conference in January of 2018. Defendants deny any remaining allegations of Paragraph 130 of the First Amended Complaint.

Alleged Induced Infringement by BGI Genomics

131. Paragraph 131 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 131 of the First Amended Complaint.

132. Paragraph 132 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 132 of the First Amended Complaint.

133. Paragraph 133 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 133 of the First Amended Complaint.

134. Paragraph 134 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 134 of the First Amended Complaint.

135. Paragraph 135 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 135 of the First Amended Complaint.

136. Paragraph 136 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 136 of the First Amended Complaint.

137. Paragraph 137 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 137 of the First Amended Complaint.

138. Paragraph 138 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 138 of the First Amended Complaint.

Alleged Contributory Infringement by BGI Genomics

139. Paragraph 139 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 139 of the First Amended Complaint.

140. Paragraph 140 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 140 of the First Amended Complaint.

Alleged Willful Infringement by BGI Genomics

141. Paragraph 141 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 141 of the First Amended Complaint.

142. Paragraph 142 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 142 of the First Amended Complaint.

143. Paragraph 143 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 143 of the First Amended Complaint.

BGI Americas' Alleged Infringement of the '200 Patent

144. Paragraph 144 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 144 of the First Amended Complaint.

Alleged Direct Infringement by BGI Americas

145. Paragraph 145 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 145 of the First Amended Complaint.

Alleged Induced Infringement by BGI Americas

146. Paragraph 146 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 146 of the First Amended Complaint.

147. Paragraph 147 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 147 of the First Amended Complaint.

148. Paragraph 148 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 148 of the First Amended Complaint.

149. Paragraph 149 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 149 of the First Amended Complaint.

150. Paragraph 150 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 150 of the First Amended Complaint.

151. Paragraph 151 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 151 of the First Amended Complaint.

Alleged Contributory Infringement by BGI Americas

152. Paragraph 152 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 152 of the First Amended Complaint.

153. Paragraph 153 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 153 of the First Amended Complaint.

Alleged Willful Infringement by BGI Americas

154. Paragraph 154 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 154 of the First Amended Complaint.

155. Paragraph 155 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 155 of the First Amended Complaint.

156. Paragraph 156 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 156 of the First Amended Complaint.

MGI Tech's Alleged Infringement of the '200 Patent

157. Paragraph 157 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 157 of the First Amended Complaint.

Alleged Direct Infringement by MGI Tech

158. Paragraph 158 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 158 of the First Amended Complaint.

Alleged Induced Infringement by MGI Tech

159. Paragraph 159 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 159 of the First Amended Complaint.

160. Paragraph 160 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 160 of the First Amended Complaint.

161. Paragraph 161 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 161 of the First Amended Complaint.

162. Paragraph 162 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 162 of the First Amended Complaint.

163. Paragraph 163 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 163 of the First Amended Complaint.

164. Paragraph 164 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 164 of the First Amended Complaint.

165. Paragraph 165 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 165 of the First Amended Complaint.

166. Paragraph 166 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 166 of the First Amended Complaint.

Alleged Contributory Infringement by MGI Tech

167. Paragraph 167 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 167 of the First Amended Complaint.

168. Paragraph 168 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 168 of the First Amended Complaint.

Alleged Willful Infringement by MGI Tech

169. Paragraph 169 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 169 of the First Amended Complaint.

170. Paragraph 170 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 170 of the First Amended Complaint.

171. Paragraph 171 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 171 of the First Amended Complaint.

MGI Americas' Alleged Infringement of the '200 Patent

172. Paragraph 172 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 172 of the First Amended Complaint.

Alleged Direct Infringement by MGI Americas

173. Paragraph 173 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that MGI Americas has used certain BGISEQ and MGISEQ sequencers at its San Jose,

California facility. Defendants deny any remaining allegations of Paragraph 173 of the First Amended Complaint.

Alleged Induced Infringement by MGI Americas

174. Paragraph 174 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 174 of the First Amended Complaint.

175. Paragraph 175 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 175 of the First Amended Complaint.

176. Paragraph 176 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 176 of the First Amended Complaint.

177. Paragraph 177 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 177 of the First Amended Complaint.

178. Paragraph 178 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 178 of the First Amended Complaint.

179. Paragraph 179 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 179 of the First Amended Complaint.

180. Paragraph 180 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 180 of the First Amended Complaint.

181. Paragraph 181 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 181 of the First Amended Complaint.

Alleged Contributory Infringement by MGI Americas

182. Paragraph 182 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 182 of the First Amended Complaint.

183. Paragraph 183 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 183 of the First Amended Complaint.

Alleged Willful Infringement by MGI Americas

184. Paragraph 184 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 184 of the First Amended Complaint.

185. Paragraph 185 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 185 of the First Amended Complaint.

186. Paragraph 186 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 186 of the First Amended Complaint.

CGI's Alleged Infringement of the '200 Patent

187. Paragraph 187 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 187 of the First Amended Complaint.

Alleged Direct Infringement by CGI

188. Paragraph 188 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants admit that CGI has used certain BGISEQ and MGISEQ sequencers at its San Jose, California facility. Defendants deny any remaining allegations of Paragraph 188 of the First Amended Complaint.

Alleged Induced Infringement by CGI

189. Paragraph 189 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 189 of the First Amended Complaint.

190. Paragraph 190 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 190 of the First Amended Complaint.

191. Paragraph 191 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 191 of the First Amended Complaint.

192. Paragraph 192 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 192 of the First Amended Complaint.

193. Paragraph 193 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 193 of the First Amended Complaint.

194. Paragraph 194 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 194 of the First Amended Complaint.

195. Paragraph 195 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 195 of the First Amended Complaint.

196. Paragraph 196 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 196 of the First Amended Complaint.

Alleged Contributory Infringement by CGI

197. Paragraph 197 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 197 of the First Amended Complaint.

198. Paragraph 198 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 198 of the First Amended Complaint.

Alleged Willful Infringement by CGI

199. Paragraph 199 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 199 of the First Amended Complaint.

200. Paragraph 200 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 200 of the First Amended Complaint.

201. Paragraph 201 of the First Amended Complaint contains legal conclusions to which no response is required. To the extent that a response is deemed required, Defendants deny the allegations of Paragraph 201 of the First Amended Complaint.

RESPONSE TO PRAYER FOR RELIEF

202. Defendants deny that Plaintiffs are entitled to any of the requested relief and denies any and all allegations contained within the Prayer for Relief of the First Amended Complaint.

RESPONSE TO DEMAND FOR JURY TRIAL

203. Plaintiffs' request for a jury trial does not require a response by Defendants. Defendants also request a jury trial of all issues triable to a jury in this action.

AFFIRMATIVE DEFENSES

204. Defendants repeat and reallege their answers to Paragraphs 1-203 of the First Amended Complaint as if fully set forth herein.

205. Defendants deny that Illumina is entitled to any relief against Defendants.

206. Without assuming any burden of proof that it would not otherwise bear, Defendants assert the following separate and additional defenses, all of which are pled in the alternative, and none of which constitute an admission that Defendants are in any way liable to Plaintiffs, that Plaintiffs have been or will be injured or damaged in any way, or that Plaintiffs are entitled to any relief whatsoever. As a defense to the First Amended Complaint and each and every allegation contained therein (unless specifically stated otherwise), Defendants allege each of the following:

FIRST DEFENSE – NONINFRINGEMENT

207. Defendants have not infringed, and are not infringing, directly, contributorily, or by inducement, any valid claim of Plaintiffs' asserted patents, either literally or under the doctrine of equivalents. Defendants are not liable in any respect for any alleged infringement of the Plaintiffs' asserted patents.

SECOND DEFENSE – INVALIDITY

208. Each claim of Plaintiffs' asserted patents is invalid for failing to comply with one or more of the requirements for patentability under, including but not limited to, 35 U.S.C. §§ 101, 103, 112, and the judicial doctrine of obviousness-type double patenting. By way of example only, claim 1 of each of Plaintiffs' asserted patents is invalid as obvious over Tsien or Ju, in combination with either or both Zavgorodny 1991 and Zavgorodny 2000.[4] Also by way of example, claim 1 of each of Plaintiffs' asserted patents is also invalid for failing to sufficiently describe an azido protecting group such that one of ordinary skill would have known that the inventors were in possession of the claimed invention as of the filing date. As a further example, claim 1 of each of Plaintiffs' asserted patents is also invalid for being overly broad in scope and not adequately supported by enabling disclosure.

[4] Roger Y. Tsien et al., WO 91/06678 A1 (published May 16, 1991) ("Tsien"); Jingyue Ju et al., U.S. Patent 6,664,079 B2 (Dec. 16, 2003) ("Ju"); Sergey Zavgorodny et al., *1-Alkylthioalkylation of Nucleoside Hydroxyl Functions and Its Synthetic Applications*, TETRAHEDRON LETTERS 32:7593-96 (1991) ("Zavgorodny"); S.G. Zavgorodny et al., *S,X-Acetals in Nucleoside Chemistry, III, Synthesis of 2'- and 3'-O-Azidomethyl Derivatives of Ribonucleosides*, NUCLEOSIDES, NUCLEOTIDES & NUCLEIC ACIDS 19:1977-91 (2000) ("Zavgorodny 2000").

THIRD DEFENSE – PROSECUTION LACHES

209. Illumina's First and Second Causes of Action are barred from relief under the doctrine of prosecution laches.

FOURTH DEFENSE – PROSECUTION HISTORY ESTOPPEL

210. Illumina is barred from relief for its First and Second Causes of Action, in whole or in part, under the doctrine of prosecution history estoppel.

FIFTH DEFENSE – ESTOPPEL, LACHES, WAIVER, ACQUIESCENCE & UNREASONABLE DELAY

211. Illumina's claims are barred, in whole or in part, by the doctrines of estoppel, laches, waiver, acquiescence and/or unreasonable delay. Illumina unreasonably delayed in bringing suit until well after each of these effects occurred, despite the substantial harm they allegedly produced. Assuming, *arguendo*, that any actionable harm occurred, this delay, in part, prevented Defendants from curing any injury with Illumina, causing material prejudice and injury to Defendants. Illumina has known that BGI Genomics and its affiliates have offered sequencing services in foreign countries and that CGI has had a research facility in the San Francisco Bay Area at least as of 2010, when CGI filed a motion to transfer a suit brought by Illumina to this District. *Illumina Inc. et al v. Complete Genomics Inc.*, Case No. 3:10-cv-05542-EDL, D.N. 12.

SIXTH DEFENSE – STATUTE OF LIMITATIONS

212. Illumina's purported claims for patent infringement are barred, in whole or in part, to the extent that they allege acts of infringement barred by the statute of limitations.

SEVENTH DEFENSE – 35 U.S.C. § 287

213. Illumina's First and Second Causes of Action and Prayer for Relief are limited by 35 U.S.C. § 287.

EIGHTH DEFENSE – ADEQUATE REMEDY AT LAW

214. Illumina has an adequate remedy at law and the alleged injury to Illumina is not immediate or irreparable. Any injury, to the extent any occurred, could be cured with damages alone. Accordingly, there is no factual or legal basis for a grant of equitable relief.

NINTH DEFENSE – NO ENHANCED DAMAGES

215. Defendants have not engaged in any conduct that would entitle Illumina to an award of enhanced damages.

TENTH DEFENSE NO EXCEPTIONAL CASE

216. Defendants have not engaged in any conduct that would make this an exceptional case or that would entitle Illumina to an award of attorneys' fees.

ELEVENTH DEFENSE - INEQUITABLE CONDUCT

217. Illumina's claims are barred, in whole or in part, by the doctrine of inequitable conduct.

218. The '537 and '200 Patents are unenforceable because Illumina, through their counsel and retained expert, have repeatedly and intentionally misled, deceived, and made false statements to the Patent Trial and Appeal Board ("PTAB") and Federal Circuit in defending the '537 Patent's validity.[5] As explained in further detail below, Illumina's counsel and retained expert (1) knew of the falsity of these representations, (2) knew they were material to the validity of the '537 Patent, and (3) made them with the specific intent of deceiving the PTAB and Federal Circuit in order to maintain the validity of the '537 Patent. Had the PTAB and Federal Circuit been aware of the falsity of these representations, the '537 Patent would have been held invalid. The individuals who made these false statements and representations, including sworn declarations, on behalf of Illumina include at least Illumina's retained expert, Dr. Floyd E. Romesberg, and Illumina's attorneys Robert A. Lawler, then of Reinhart Boerner Van Deuren s.c., William R. Zimmerman, Jonathan E. Bachand, Sheila N. Swaroop, Kerry S. Taylor, Michael

[5] The '200 Patent issued from a chain of applications leading back to the '537 Patent and is terminally disclaimed to the '537 Patent. Moreover, claims of the '200 Patent are nearly verbatim identical to claims of the '537 Patent. *Compare, e.g.*, '537 Patent, claim 1, *with* '200 Patent, claim 1. Accordingly, Illumina's inequitable conduct with respect to the '537 Patent relates to the claims of the '200 Patent, and the '200 Patent is therefore unenforceable under the doctrine of infectious unenforceability.

(continued...)

L. Fuller, Joseph S. Cianfrani, Brenton R. Babcock, and Nathanel R. Luman of Knobbe Martens Olson & Bear, LLP, and Derek C. Walter of Weil, Gotshal & Manges LLP, and possibly others.

219. In addition to the explicit evidence that Illumina's expert and counsel had a specific intent to deceive, which is identified below, a specific intent to deceive can be inferred from their willingness to repeatedly and egregiously make false statements and misrepresentations to the PTAB and Federal Circuit in defense of the '537 Patent's validity.

220. Each material misrepresentation is detailed in the following paragraphs.[6]

Illumina's False Statements Conflating Reaction *Efficiency* with Reaction *Yield*

221. In 2013, Intelligent Bio-Systems (hereinafter "IBS") filed two IPR petitions against the '537 Patent. *See, e.g.*, Ex. A (*Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, IPR2013-00517, Paper 1 (PTAB Aug. 19, 2013)); s*ee also Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, IPR2013-00518, Paper 1 (PTAB Aug. 19, 2014). One petition, IPR2013-00518, led to Illumina filing a Request for Adverse Judgment, thereby cancelling claims 7 and 11-14 of the '537 Patent. *See Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, IPR2013-00518, Paper 28 (PTAB May 5, 2014). In IPR2013-00517, the other IPR, the Board and Federal Circuit (relying on the misrepresentations outlined below) upheld the validity of the remaining claims of the '537 Patent. *See Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, IPR2013-00517, Paper 87 (PTAB Feb. 11, 2015); *Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd*., 821 F.3d 1359 (Fed. Cir. 2016).

222. On May 5, 2014, Illumina's counsel Robert A. Lawler, Brenton R. Babcock, William R. Zimmerman, and Jonathan E. Bachand filed Illumina's Patent Owner Response. *See* Ex. B (*Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, IPR2013-00517, Paper 33 (PTAB May 5, 2014)). On September 2, 2014, Illumina's counsel Robert A. Lawler, Brenton R. Babcock, William R. Zimmerman, Jonathan E. Bachand, Sheila N. Swaroop, and Derek C. Walter filed Illumina's Motion for Observation on the Cross-Examination Testimony of Bruce

[6] The evidence cited in support of Defendants' Inequitable Conduct defense is exemplary. The full extent of each of Illumina's misrepresentations and false statements will be the subject of discovery and will be proven at trial.

Branchaud, Ph.D and Michael Metker, Ph.D. *See* Ex. C (*Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, IPR2013-00517, Paper 64 (PTAB Sept. 2, 2014)). On October 28, 2015, Illumina's counsel, Brenton R. Babcock, Joseph S. Cianfrani, Sheila N. Swaroop, Kerry S. Taylor, Nathanael R. Luman, William R. Zimmerman, and Jonathan E. Bachand, filed Illumina's Brief of Patent Owner-Appellee Illumina Cambridge Ltd. to the Federal Circuit. *See* Ex. D (*Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd*., Case No. 15-1693, D.N. 30 (Fed. Cir. Oct. 28, 2015)). In each of these filings Illumina's counsel made false statements regarding prior art references which conflated reaction efficiency with reaction yield.

223. Reaction efficiency, also known as conversion, is used to denote the amount of product that is actually formed during a chemical reaction. Reaction yield, by contrast, is used to denote the amount of product which can be isolated, or collected, after the chemical reaction. Reaction "efficiency" is therefore the theoretical ***maximum*** for "yield," because a product cannot be isolated or collected if it was not formed in the first place. By the same token, reaction "yield" is the theoretical ***minimum*** for "efficiency," because every bit of product that is isolated or collected had to have been first formed. In practice, reaction efficiency is typically higher than reaction yield because at least some product will be lost while purifying the product from the other byproducts. As an example, a chemical reaction could have an efficiency of 90%, meaning that 90% of the chemical reactants actually reacted to form product. That same chemical reaction could have a yield of 45% if, for example, half of the product actually formed is lost during purification.

224. In Illumina's Patent Owner Response in IPR2013-00517, Illumina's counsel argued that one of ordinary skill in the art would not have been motivated to combine prior art references Tsien or Ju with another reference, Zavgorodny, because the reaction efficiency of the azidomethyl removal would not be high enough to motivate one of ordinary skill in the art to try that protecting group. *See* Ex. B at, *e.g.*, 3 ("IBS's petition also fails to consider several important teachings in Zavgorodny that render his azidomethyl ether and removal conditions incompatible with Tsien and Ju's express DNA sequencing requirements. In particular, IBS fails to consider that a person of ordinary skill in the art would have thought that … Zavgorodny's removal

conditions would not be quantitative or rapid"). Although (as acknowledged by the Federal Circuit) removal of the azidomethyl protecting group at any level of efficiency is not required by the claims of the '537 Patent, Illumina argued that expectations of low deprotection efficiency would teach away from the use of the azidomethyl group, undermining motivation to combine. *Id*. at 23-30. Illumina continued this line of argument on appeal to the Federal Circuit. Ex. D at *e.g.*, 6-9, 32-37.

225. In Illumina's May 5, 2014 Patent Owner Response, Illumina's counsel falsely stated that Loubinoux, a key prior art document related to the azidomethyl protecting group, disclosed "60-80% removal *efficiency*" and supported this statement with a citation to Dr. Romesberg's expert declaration, which accurately noted that Loubinoux reported pure product *yields* of 60-80%.

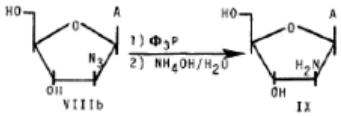
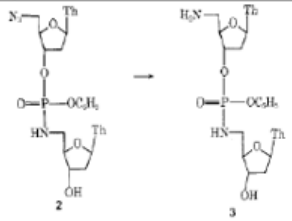
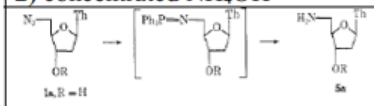
> Loubinoux reports 60-80% removal ***efficiency*** for phenolic azidomethyl groups using triphenylphosphine in tetrahydrofuran and water at 25 °C. Ex. 1006 at 4-5 ("Regardless of the reduction method used, [the products] are obtained as ***pure products at a yield*** between 60 and 80%."); Romesberg Decl. ¶ 44 (Ex. 2011).

Ex. B at 24 (emphasis added). Thus, Illumina's counsel purposefully conflated efficiency and yield, thereby misrepresenting the disclosure of Loubinoux. Illumina's counsel doubled down on this misrepresentation by arguing that "Loubinoux's azidomethyl ether removal efficiency of 60-80% provides an expectation that Zavgorodny's azidomethyl ether would not proceed quantitatively[.]" *Id*. at 23-24 (emphasis added). These statements are demonstrably false, as Illumina's own expert admitted in deposition that Loubinoux reports isolated pure product yields—not reaction efficiency.

> Just for the record, does that confirm to you that Loubinoux's yields are yields of the pure product after a purification?
>
> A. Of 60 to 80 percent, yes.
>
> Q. Now, you would agree that it's possible that you can lose some of the resulting product during purification process?
>
> A. That is possible.

Ex. E (Excerpts from the Transcript of the July 8, 2014 Deposition of Dr. Floyd Romesberg, *Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, IPR2013-00517, Ex. 1025) at 124:6-13; *see also* Ex. F (*Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, IPR2013-00517, Ex. 2011 (PTAB May 5, 2014)) at ¶ 44.

226. Similarly, in Illumina's September 2, 2014 Motion for Observation, Illumina's counsel falsely stated that several prior art references "resulted in just 50-90% ***efficiencies***" and supported this statement with citations to exhibits and an expert declaration from Dr. Romesberg attached to their Patent Owner Preliminary Response. Ex. C at 8 (emphasis added). Illumina's counsel further falsely asserted that "[t]hese ***efficiencies are insufficient*** to meet the requirements of Ju's and Tsien's methods. Ex. F at ¶ 50." *Id.* (emphasis added). These statements are demonstrably false because the exhibits referenced by Illumina's counsel were reporting *yield*, not *efficiency*. As just one example, the paragraph of Dr. Romesberg's declaration which Illumina's counsel cited included the chart below, which clearly states that the references were reporting *yield*:

Reaction	Time	Yield	Reference
 1) PPh_3 in pyridine, 2) concentrated NH_4OH in H_2O	--	50%	Ranganathan et al., Tet. Lett., 45:4341, 4343 (1978) (Ex. 2013).
 1) PPh_3 in pyridine, 2) concentrated NH_4OH	72 h	78%	Mungall et al., J. Org. Chem., 40:1659, 1662 (1975) (Ex. 2014).
 1) PPh_3 in pyridine, 2) 50% saturated methanolic	3 h	90%	Mungall et al., J. Org. Chem., 40:1659, 1661 (1975) (Ex. 2014).

Ex. F at ¶ 50 (excerpted and annotated). As another example, Dr. Romesberg specifically admitted in his July 8, 2014 deposition that each of the references identified in ¶ 50 reported *yield*, not *efficiency*:

> Q. If you'll take a look at table 1 in your declaration, starts on page 25.
>
> And, again, just so we're clear, you have a column that says "Yield" in that table; is that correct?
>
> A. I do, yes.
>
> Q. And those yields are, again, pure product yields?
>
> A. I believe so.
>
> Q. So they're not actually measuring the removal efficiency, or they're -- actually here is the reduction from the azide to the amine?
>
> A. Correct. Right. Correct. Again, I'd like to emphasize that you could apply this logic to any reaction, in which case the entire body of our understanding of chemical reactivity would be in question, and there's no one who thinks that.

Ex. E, at 137:10-25.

227. Additionally, Dr. Romesberg admitted the important differences between yield and efficiency during his deposition, and admitted that in some cases a reaction could be quantitative, as Illumina's counsel argued was required by Tsien and Ju, but that the reported yield could still be low because of difficulties in purification:

> Q. So if you had a product that was difficult to purify, it's possible that the reaction actually goes quantitative but that because of the difficult purification products, you actually get a low pure product yield?
>
> A. That's certainly possible, and I certainly would expect that to be pointed out in the text, because people could say that they measured yields by NMR, people could say that they measured yields by UV and they consistently found the reaction itself yielded this, but then upon purification, they could only recover this.

Id. at 126:11-22.

228. In Illumina's Brief of Patent Owner-Appellee Illumina Cambridge Ltd. to the Federal Circuit filed on October 28, 2015, Illumina's counsel, Brenton R. Babcock, Joseph S. Cianfrani, Sheila N. Swaroop, Kerry S. Taylor, Nathanael R. Luman, William R. Zimmerman, and Jonathan E. Bachand, repeated these false statements to the Federal Circuit. Ex. D at 12 ("In particular, ***Loubinoux reported a 60-80% removal efficiency*** for azidomethyl groups from phenols using triphenylphosphine" (emphasis added)); *id* at 33 ("3'-O-azidomethyl protecting group on a nucleotide would have been expected to cleave with lower efficiency than ***the 60-80% efficiency taught by Loubinoux*** for removal of azidomethyl groups from phenol" (emphasis added)).

229. These misrepresentations by Illumina's counsel which conflated *yield* and *efficiency* are significant because Illumina's counsel was falsely representing that the values reported were the ***maximum*** achievable reaction conversions for those reactions, when, in reality,

these isolated pure product yields represented the theoretical ***minimum*** of achievable reaction conversion. Illumina's counsel deceptively used this conflation between the maximum achievable reaction conversion and the minimum achievable reaction conversion to argue that one of ordinary skill in the art would be deterred from trying an azidomethyl group, as required by the '537 Patent, because the *maximum* reaction conversion (*i.e.*, efficiency) for the removal step was reported to be too low. As admitted by Dr. Romesberg, these reported values were actually the theoretical *minimum* of potential reaction conversion (*i.e.*, yield). Ex. E at 124:6-13 (admitting Loubinoux reports pure product yield); 137:10-25 (admitting other references report yield, not reaction efficiency). One of ordinary skill would not have been deterred by these reports, because the actual efficiency of the reaction was likely higher than the reported pure product yields, which were measured after various purification methods that could lead to lost product.

230. Illumina's counsel, Messrs. Lawler, Babcock, Zimmerman, Luman, Walter, and Mses. Swaroop's knowledge of the falsity of these representations is supported by the fact that some of the statements conflating yield and efficiency were made in a September 2, 2014 filing, nearly two months *after* Dr. Romesberg's July 8, 2014 deposition. Similarly, statements were made by Illumina's counsel, Messrs. Babcock, Cianfrani, Taylor, Luman, Zimmerman, and Bachand, and Mses. Swaroop in Illumina's October 28, 2015 Federal Circuit brief after Dr. Romesberg directly acknowledged the difference between yield and efficiency and admitted that none of Illumina's cited references report reaction efficiency. Moreover, Dr. Romesberg's deposition was attended by Illumina's counsel Sheila N. Swaroop and Nathanael R. Luman, as well as a representative from Illumina, Marcus Burch. Furthermore, Dr. Romesberg testified that his declaration was "written by my lawyers at Knobbe Martens." Ex. E at 14:6-10. Therefore, it is clear that these attorneys understood the important difference between reaction efficiency and reaction yield, and that they were falsely characterizing the references and Dr. Romesberg's declaration in their September 2, 2014 Motion for Observation and later in the October 28, 2015 Federal Circuit brief. Nonetheless, these attorneys made these affirmative misrepresentations with the intent of deceiving the PTAB and Federal Circuit. Messrs. Lawler, Babcock,

Zimmerman, Luman, Walter, Cianfrani, Taylor, and Bachand and Mses. Swaroop did not perform their sworn duty of candor and good faith in dealing with the PTAB and Federal Circuit.

231. Illumina's counsel's intentional misrepresentations conflating reaction efficiency with reaction yield were material to the PTAB's determination and Federal Circuit's upholding of the PTAB's decision. As evidence, these misrepresentations were specifically cited by the PTAB in its Final Written Decision:

> In contrast, Patent Owner argues, prior art of record, including the Loubinoux reference, demonstrates that an ordinary artisan would have expected Zavgorodny's azidomethyl group ***to be removed at a much lower efficiency*** than required by Tsien's methods.

Ex. G (*Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd.*, IPR2013-00517, Paper 87 (PTAB Feb. 11, 2015)) at 8 (emphasis added).

> As discussed above, moreover, the prior art suggests that an ordinary artisan ***would not have expected Zavgorodny's azidomethyl group to be removed quantitatively, as Tsien requires***. We, therefore, agree with Patent Owner that Petitioner has not shown that an ordinary artisan would have considered it obvious to use Zavgorodny's azidomethyl protecting group in Tsien's sequencing methods.

Id. at 14 (emphasis added).

232. The Federal Circuit also specifically relied on Illumina's misrepresentations in upholding the PTAB's decision. The Federal Circuit explicitly emphasized that the expectation of low removal efficiency was fatal to IBS's challenge because it undermined the **only** asserted motivation to combine Tsien or Ju with Zavgorodny:

> "[T]he Petition did not provide a specific or credible explanation why an ordinary artisan would have expected Zavgorodny's azidomethyl protecting group to meet Tsien's quantitative deblocking requirement[.] . . . [This finding] is central to a finding of no motivation to combine. This is because the petitioner's *sole* argument for [motivation to combine] was because it would meet Tsien's quantitative deblocking requirement."

Ex. H (*Intelligent Bio-Systems, Inc. v. Illumina Cambridge Ltd*., 821 F.3d 1359, (Fed. Cir. 2016)) at 1368 (emphasis in original).

233. In upholding the Board's decision, the Federal Circuit repeatedly relied on Illumina's counsel's misrepresentation that the cited references, and Loubinoux in particular, disclosed reaction efficiencies. *Id.* at 1368 ("Loubinoux, which teaches that azidomethyl methyl groups are removed from phenols with modest ***efficiency*** (60-80% yield). . ." (emphasis added)); *id* at 1365 ("Loubinoux reports a 60-80% removal ***efficiency*** for azidomethyl groups from phenols using triphenylphosphine. 60-80% removal is not quantitative removal within the meaning of Tsien and Ju." (emphasis added)). Relying on Illumina's counsel's misrepresentations, the Federal Circuit upheld the PTAB's decision, concluding that "azidomethyl would have been expected to perform inefficiently" in the context of SBS. *Id.* at 1369.

234. Illumina's misrepresentations concerning the disclosures in Loubinoux were further compounded during Dr. Romesberg's deposition when he falsely characterized Loubinoux's references to "unstable phenols" as referring to the intermediate of azidomethyl deprotection. Ex. E at 135:9-12 ("I mean if you look at Loubinoux's title of his paper, he talks about unstable phenols, because they're not stable because they're hydrolyzing in this last step" of azidomethyl deprotection); *id.* at 133:18-23 (describing the "last step" of azidomethyl deprotection as hydrolysis to the alcohol). Throughout Loubinoux,[7] the authors clearly state that the phenol products—not the deprotection intermediates (which are not phenols)—are unstable, and separately referred to the intermediates as "aryloxymethylamines 4 which evolve very rapidly to the corresponding phenol." *See* Ex. I (B. Loubinoux, et al., *Protection of Phenols by the Azidomethylene Group Application to the Synthesis of Unstable Phenols*, 44 TETRAHEDRON 6055 (1988)). Furthermore, as admitted by Dr. Romesberg, Loubinoux reports isolated product yield ***after purification***. *Id*. at 6057 ("Regardless of the reduction method used, they are obtained as ***pure products with a yield of between 60 and 80%***.") (emphasis added). Dr. Romesberg, having closely reviewed Loubinoux was aware that Loubinoux's references to "unstable phenols" did not

[7] The version of Loubinoux attached hereto as Exhibit I is the translation of Loubinoux that was filed as Exhibit 1006 in IPR2015-00517 and discussed by Illumina's counsel, the PTAB, and the Federal Circuit.

describe the deprotection intermediates, but rather described the products themselves. Given the clarity with which Loubinoux described the "unstable phenols" as the products themselves, the only plausible basis for Dr. Romesberg's misrepresentation during his deposition was to avoid the conclusion that the pure product yields reported in Loubinoux were actually poor proxies for reaction efficiency, and that the true efficiency of the azidomethyl deprotection was likely to be much greater. Dr. Romesberg admitted in deposition that difficulty of purification could lead to yields that are significantly lower than the actual reaction efficiency. Ex. E at 126:11-22. Throughout Loubinoux's paper, the products are described as unstable and difficult to purify. By mischaracterizing Loubinoux's references to instability of the products, Dr. Romesberg affirmatively sought to avoid the fact that the actual efficiency of azidomethyl deprotection would have been significantly higher than the reported yields, because product would have been lost due to decomposition and difficulty of purification. These affirmative misrepresentations were relied on by the PTAB and Federal Circuit in finding that the removal of azidomethyl from the aliphatic hydroxyl of the nucleotide would be expected to perform less efficiently than it would for those products in Loubinoux.

235. But for these intentional misrepresentations by Illumina's counsel, the PTAB or Federal Circuit would have held differently, and the '537 Patent would have been invalidated.

236. The foregoing facts demonstrate that Illumina's counsel Messrs. Lawler, Babcock, Zimmerman, Luman, Walter, Cianfrani, Taylor, and Bachand and Mses. Swaroop, and possibly others, knowingly and deliberately made material misrepresentations to the PTAB and Federal Circuit with the specific intent to deceive. This is the single most reasonable inference from these facts.

237. These facts also demonstrate that Dr. Romesberg, as well as Illumina's counsel Messrs. Lawler, Babcock, Zimmerman, Luman, Walter, Cianfrani, Taylor, and Bachand and Mses. Swaroop, and possibly others, engaged in affirmative egregious misconduct towards the PTAB, the PTO, and Federal Circuit.

Illumina's False Statements Pertaining to the Rigidity and Bulk of the Azidomethyl Group

238. On January 23, 2018, Illumina's counsel, Kerry S. Taylor, Michael L. Fuller, and Nathanael R. Luman filed Illumina's Patent Owner Preliminary Response in two IPRs filed by CGI. *See* Ex. J (*Complete Genomics, Inc. v. Illumina Cambridge Ltd.*, IPR2017-02172, Paper 6 (PTAB Jan. 23, 2018)), and Ex. K (*Complete Genomics, Inc. v. Illumina Cambridge Ltd.*, IPR2017-02174, Paper 6 (PTAB Jan. 23, 2018)). These Patent Owner Preliminary Responses were supported by a declaration from Illumina's expert, Dr. Floyd Romesberg. Ex. L (*Complete Genomics, Inc. v. Illumina Cambridge Ltd.*, IPR2017-02174, Ex. 2024. (PTAB Jan. 23, 2018)). In these filings both Illumina's counsel and Dr. Romesberg made false statements regarding the flexibility and shape of the 3'-azidomethyl group that is claimed by the '537 Patent.

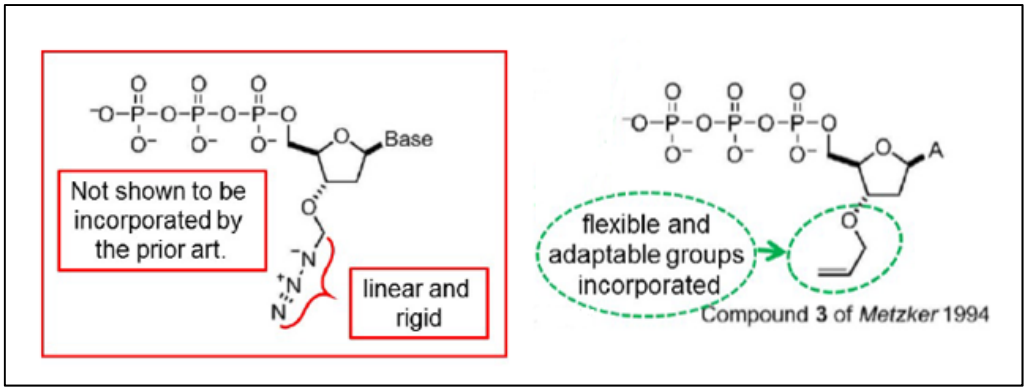
239. As discussed in more detail below, the falsity of these statements and Dr. Romesberg's knowledge of this falsehood can be proven by other sworn statements in his expert declarations, exhibits cited in his expert declarations, which he specifically reviewed in drafting his declarations, and the fundamental chemistry knowledge within his capacity as a testifying expert.

240. In his declarations, Dr. Romesberg falsely stated that the azidomethyl group is "linear and rigid" and falsely contrasted the azidomethyl group to the 3'-moieties of Metzker, a reference pertinent to these IPR petitions, which he characterized as "provid[ing] significant flexibility and adaptability."

> Thus, the Hovinen and ***Metzker 3'-moieties provides [sic] significant flexibility and adaptability*** to adopt configurations compatible with the geometry of the polymerase active site. The incorporability of these 3'-moieties would not lead a person of ordinary skill in the art to look to the **linear and rigid azidomethyl group** as a similarly suitable polymerase substrate.

Ex. L at ¶ 27.

241. Dr. Romesberg further provided a figure that falsely contrasts the "linear and rigid" 3'-O-azidomethyl group specifically to the "flexible and adaptable" 3'-O-allyl group of Metzker.



Id. at ¶ 26 (adapted from figure).

242. Dr. Romesberg's representation that 3'-O-azidomethyl group is "linear and rigid" while the entire 3'-O-allyl group is "flexible and adaptable" is plainly false,[8] which Dr. Romesberg should have known, and indeed does know, as he had been a professor in the Department of Chemistry at the Scripps Research Institute for more than 15 years. *See* Ex. M (Curriculum Vitae of Floyd Romesberg, filed in IPR2017-02174).

243. As shown in **Figure 1** below, both the 3'-O-azidomethyl group and the 3'-O-allyl group have the same number of rotatable bonds, allowing for substantially the same degree of flexibility.

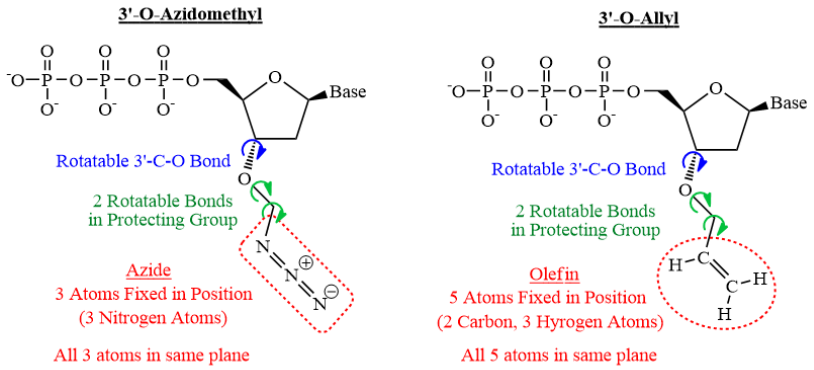


Figure 1: Flexible and rigid portions of the 3'-O-azidomethyl and 3'-O-allyl nucleotides.

[8] In the figure provided by Dr. Romesberg and Illumina's counsel, the ***entire*** 3'-O-allyl group is circled in green and denoted "flexible and adaptable." Yet, as described in greater detail, the olefin (–HC=CH_2) portion of the 3'-O-allyl group is rigid in a similar manner to the azide portion of the 3'-O-azidomethyl group.

244. As shown in **Figure 1**, the rotatable bonds on the 3'-O-azidomethyl and 3'-O-allyl groups are the two single bonds with green arrows depicting the axis of rotation about the bond. In addition, the C-O single bond of the nucleotide can also rotate around its bond axis, as indicated by the blue arrows in **Figure 1**. Thus, **Figure 1** shows that the 3'-O-azidomethyl group and the 3'-O-allyl group each have the same number of rotatable single bonds in exactly the same portion of the molecule. Each molecule also has a rigid portion (*i.e.*, the azide of azidomethyl and the olefin of the allyl group), depicted above as the portions of the molecules within the red perimeter. Furthermore, these rigid portions of the molecule (*i.e.*, the azide[9] and olefin,[10] respectively) are located on the same portion of the molecule. The single bonds in each molecule allow the two 3'-protecting groups to exhibit nearly identical degrees of flexibility, allowing both molecules to orient their respective rigid portions in the same manner. Therefore, Dr. Romesberg's assertion that the 3'-O-allyl group is "flexible and adaptable," while the azidomethyl is "rigid" is patently false.

245. Statements from Dr. Romesberg's own declaration prove that Dr. Romesberg knew that these representations regarding the flexibility and adaptability of the 3'-O-azidomethyl group and the 3'-O-allyl were false:

> Hovenin expressly designed nucleotide analogs to have a flexible 3'-moeity to adapt to the shape of the polymerase active site. This is reflected in the Figure by the majority of the bonds being represented as **'single bonds'** with single lines. ***All of these substituents have significantly more ability to bend and rotate to adopt different shapes***.

[9] Although the simplified Lewis Structure shown in Figure 1 shows one possible resonance structure of the azido having formal positive and negative charges, it was widely understood at the time that no one Lewis Structure could adequately represent the charge distribution over the azide. In fact, each nitrogen on the azide bears a partial positive or partial negative charge distribution, rather than a single full formal charge. Moreover, the alkyl azides themselves are uncharged (*i.e.*, the azide portion of the molecule is neutral, holding no net charge.

[10] Although the C-H single bonds of the olefin may allow for rotation about the C-H axis, such rotation does not change the relative orientation of the hydrogen and carbon atoms of the olefin. Thus, the whole olefin ($-HC=CH_2$) is effectively rigid in the same manner as the azide.

Ex. L at ¶ 27 (acknowledging the ability for single bonds to rotate, thereby imparting flexibility to the molecule (emphasis added)).

> The bonds that connect the three N atoms are not free to bend (this is often indicated by drawing the azido group as either N^-–N^+≡N or –N=N=N, with ***the two "double bonds" of the later [sic] representation intended to reflect its inability to bend***).

Id. at ¶ 25 (acknowledging the restricted flexibility of double bonds (emphasis added)). Thus, it is clear that Dr. Romesberg understands the fundamental principal that single bonds can rotate, imparting flexibility, and double bonds cannot, creating areas of rigidity within a molecule. Therefore, Dr. Romesberg understood that his assertions that the 3'-O-allyl group is "flexible and adaptable," while the azidomethyl is "rigid" were patently false. Nonetheless, Dr. Romesberg made these assertions with the specific intent of affirmatively misleading the PTAB.

246. Furthermore, Dr. Romesberg's knowledge of the falsity of these representations regarding the flexibility and adaptability of the 3'-O-azidomethyl group and the 3'-O-allyl is supported by basic tenants of organic chemistry that are taught in introductory courses. Dr. Romesberg had been a Professor in the Department of Chemistry at the Scripps Research Institute, an elite graduate institution, for more than 15 years and was well aware of these basic tenants of organic chemistry.

247. For example, an introductory organic chemistry textbook from the year 2000 (*i.e.*, before the priority date of the '537 and '200 Patents), explains in the early chapters that "single bonds" between atoms are generally free to rotate about the axis of the bond, while "double bonds" and "triple bonds" are not able to rotate and their bond axis.

> The various spatial arrangements available to a molecule by rotation about single bonds are called **conformations,** and **conformational analysis** is the study of the differences in stability and properties of the individual conformations. Rotation around carbon–carbon single bonds is normally very fast, occurring hundreds of thousands of times per second at room temperature. Molecules are rarely frozen into a single conformation but engage in rapid equilibration among the conformations that are energetically accessible.

Ex. N (Excerpts from F.A. Carey, *Organic Chemistry* 117 (4th Ed. 2000)) at 117.

1-Butene
(no stereoisomers possible)

2-Methylpropene
(no stereoisomers possible)

PROBLEM 5.4 How many alkenes have the molecular formula C_5H_{10}? Write their structures and give their IUPAC names. Specify the configuration of stereoisomers as cis or trans as appropriate.

In principle, *cis*-2-butene and *trans*-2-butene may be interconverted by rotation about the C-2═C-3 *double* bond. However, unlike rotation about the C-2—C-3 *single* bond in butane, which is quite fast, interconversion of the stereoisomeric 2-butenes does not occur under normal circumstances. It is sometimes said that rotation about a carbon–carbon double bond is *restricted,* but this is an understatement. Conventional laboratory sources of heat do not provide enough thermal energy for rotation about the double bond in alkenes to take place. As shown in Figure 5.2, rotation about a double bond requires the *p* orbitals of C-2 and C-3 to be twisted from their stable parallel alignment—in effect, the π component of the double bond must be broken at the transition state.

Id. at 172.

248. Moreover, the same or similar statements were made by Illumina's counsel, Kerry S. Taylor, Michael L. Fuller, and Nathanael R. Luman, in Illumina's Patent Owner Preliminary Response. *See, e.g.*, Ex. K at 31-35; Ex. J at 36-40.

249. Under 37 C.F.R. § 42.11(a) "[p]arties and individuals involved in the proceeding have a duty of candor and good faith to the Office during the course of a proceeding." This duty applies to parties and individuals during *inter partes* review proceedings. *See* 37 C.F.R. § 42.2. *See also* 37 C.F.R. § 1.555 ("However, the duties of candor, good faith, and disclosure have not been complied with if any fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct by, or on behalf of, the patent owner in the reexamination proceeding.").

250. Kerry S. Taylor holds a Ph.D. in Biochemistry and Molecular Biology from the University of Chicago and a B.S. in Chemistry from Wheaton College; Michael L. Fuller holds a M.S. and B.S. in Biology from the University of California, Los Angeles; Nathanael R. Luman holds a Ph.D. and B.S. in Chemistry from Boston University and Grove City College, respectively. *See* Ex. O (Professional Profile of Kerry Taylor, https://www.knobbe.com/attorneys/kerry-taylor), Ex. P (Professional Profile of Michael Fuller,

https://www.knobbe.com/attorneys/mike-fuller), and Ex. Q (Professional Profile of Nathanael Luman, https://www.knobbe.com/attorneys/nate-luman). The falsity of Dr. Romesberg's representations and the statements in the Patent Owner Preliminary Response would have been known to all three attorneys given their high academic achievement in chemistry and related sciences. Nonetheless, these attorneys made these affirmative misrepresentations with the intent of deceiving the PTAB. Messrs. Taylor, Fuller, and Luman did not perform their sworn duty of candor and good faith in dealing with the PTAB.

251. Dr. Romesberg and Illumina's counsel's intentional misrepresentations regarding the flexibility and adaptability of the 3'-O-azidomethyl group and the 3'-O-allyl were material to the PTAB's denial of institution of CGI's IPR. As evidence, these misrepresentations were specifically cited by the PTAB in its Decision Denying Institution:

> As Patent Owner's expert Dr. Romesberg explains, a small size is not predictive of incorporation: "Metzker demonstrated that a nucleotide analog with a small 3'-O-acyl group was not incorporated, while that with a small 3'-O-allyl group was incorporated." Ex. 2024, ¶ 31 (citing Ex. 1541 (Metzker), 4263, 4265). **Accordingly, Dr. Romesberg testifies that "[t]he rigid steric bulk of the 3'-O-azidomethyl group would have discouraged a person of ordinary skill in the art from using [that] group as a substrate to be incorporated by a polymerase.**" Ex. 2024, ¶ 31. … The evidence cited by Petitioner shows, compared to azidomethyl, substantially non-polar blocking moieties with longer and flexible arms designed to keep the bulkier groups away from the catalytic center of the polymerase. *See* Ex. 1527, 212–13; Prelim. Resp. 33–34 (annotated drawings from Metzker); Ex. 2024, ¶¶ 24–27 ("**The linear and rigid shape of an azido group is expected to behave very differently than the flexible and adaptable 3'-moieites that Hovinen and Metzker reported were incorporated**"). **We are, thus, not persuaded the structures cited by Petitioner would have been predictive of the behavior of a 3'-azidomethyl substitution at the active site.**

See, e.g., Ex. R (*Complete Genomics, Inc. et al v. Illumina Cambridge Ltd. et al.*, IPR2017-02174, Paper 20, (PTAB April 20, 2018)) at 35-36 (emphasis added).

252. But for these intentional misrepresentations by Illumina's expert and counsel, alone, or in combination with the other misrepresentations identified herein, CGI's IPRs would have been instituted, and the '537 Patent would have been invalidated.

253. The foregoing facts demonstrate that Dr. Romesberg, as well as Illumina's counsel, Messrs. Taylor, Fuller, and Luman, and possibly others, knowingly and deliberately made material misrepresentations to the PTAB with the specific intent to deceive. This is the single most reasonable inference from these facts.

254. These facts also demonstrate that Dr. Romesberg, as well as Illumina's counsel, Messrs. Taylor, Fuller, and Luman, and possibly others, engaged in affirmative egregious misconduct towards the PTAB and the PTO.

Illumina's Misleading Characterization of the Boyer Reference with Respect to the Sterics of AZT

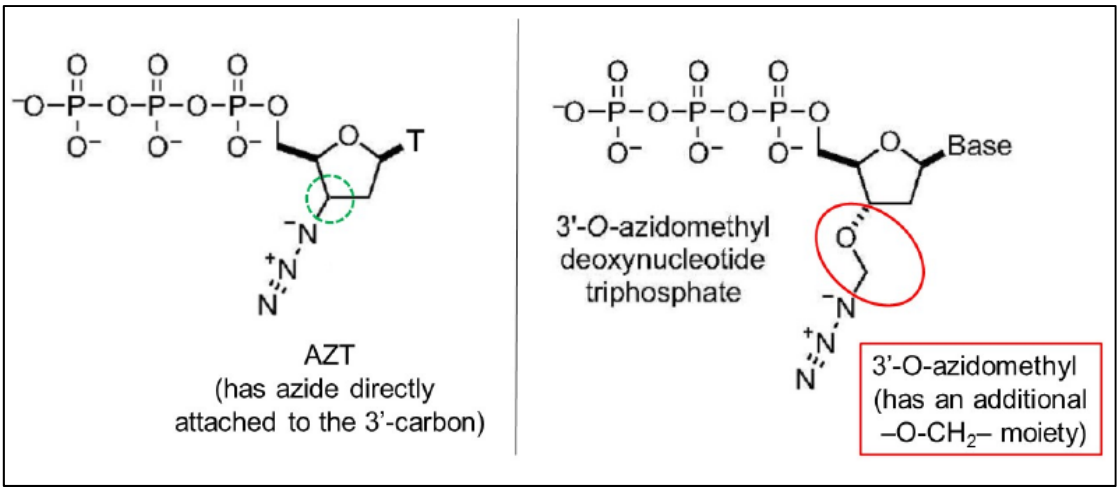
255. On January 23, 2018, Illumina's counsel, Kerry S. Taylor, Michael L. Fuller, and Nathanael R. Luman filed Illumina's Patent Owner Preliminary Response in two IPRs filed by CGI. *See* Exs. J, K. These Patent Owner Preliminary Responses were supported by a declaration from Illumina's expert, Dr. Floyd Romesberg. *See* Ex. L. In these filings, both Illumina's counsel and Dr. Romesberg made misleading characterizations of the teachings of a reference, Boyer.[11]

256. The '537 Patent requires "incorporating" a "nucleotide or nucleoside molecule" into a "nucleic acid molecule." *See* U.S. Pat. No. 7,566,537 at claim 1. In opposing CGI's IPRs regarding the '537 Patent, Illumina's counsel, Messrs. Taylor, Fuller, and Luman, argued that there was no motivation in the art to use an azidomethyl group (which is also required by the claims of the '537 Patent) because there was no expectation that it could be incorporated by a polymerase. *See* Ex. K at 30 ("There was no motivation to use an azidomethyl group in Dower's sequencing methods because there was no expectation of efficient and accurate polymerase incorporation"); Ex. J at 36 (same). In making this argument, Illumina's counsel and Dr. Romesberg mischaracterized the teachings of the Boyer reference.

[11] P.L. Boyer, et al., *Selective Excision of AZTMP by Drug-Resistant Human Immunodeficiency Virus Reverse Transcrptase*, J. Virology, 75:4832-4842 (2001), hereinafter "Boyer," attached hereto as Ex. S.

257. As discussed in more detail below, the falsity of these statements and knowledge of this falsehood can be proven simply by reading the face of Boyer.

258. The Boyer reference studied AZT, a common HIV/AIDS medication that is similar to the nucleotides claimed by the '537 and '200 Patents, except that AZT contains a 3'-azide rather than a 3'-O-azidomethyl, among other differences. Illumina's counsel explained this in the Patent Owner Preliminary Response, including via the following figure:



Ex. K at 36 (stating that "The 3'-O-azidomethyl protecting group contains an extra oxygen atom, an extra carbon atom, and two extra hydrogen atoms than the 3'-azido group of AZT").

259. Illumina's counsel then mischaracterized Boyer, arguing that the extra atoms of the 3'-O-azidomethyl, *i.e.*, –O–CH_2, would prevent a polymerase from incorporating the '3-O-azidomethyl nucleotide, even though a polymerase can incorporate AZT. Specifically, Illumina's counsel stated that "Boyer explains that incorporation of AZT results in 'the distance between D185 and the first and second azido nitrogens [to be] less than the sum of the van der Waals radii.' **Thus, AZT incorporation essentially overstuffs the polymerase[12] active site** with the

[12] Boyer's studies were directed at the relationship between AZT and the HIV Reverse Transcriptase enzyme, which performs a similar function to DNA polymerase. Whereas DNA polymerase uses a DNA template to generate a new DNA strand, HIV Reverse Transcriptase uses an RNA template to generate a new DNA strand. However, as Illumina characterized Boyer's teaching with respect to "polymerase" in their papers, the same nomenclature is adopted herein.

steric bulk of the linear and rigid 3'-azido group." Ex. K at 37 (emphasis added) (quoting Ex. S at 4838 (description of Fig. 3)).

260. Based on the misleading characterization that the incorporation of AZT "essentially overstuffs the polymerase active site," Illumina's counsel concluded that a person of ordinary skill would not expect the claimed 3'-O-azidomethyl to be incorporated because it has even more atoms than AZT: "**BGI does not explain where within the active site** the extra oxygen atom, carbon atom, and two hydrogen atoms **would be expected to fit.**" Ex. K at 37 (emphasis added).

261. Illumina's counsel's presentation of Boyer is plainly false and is a gross mischaracterization for several reasons. First, Boyer indicates that it was widely understood at the time that AZT inhibited replication of HIV because wild-type HIV reverse transcriptase readily ***incorporates*** AZT into the growing nucleotide chain. In fact, the purpose of Boyer's paper was to investigate HIV resistance caused by mutations in the reverse transcriptase that allow the enzyme to excise AZT from the nucleic acid strand ***after*** incorporation. Thus, both the wild-type and mutant enzymes discussed in Boyer's paper effectively incorporate AZT into the growing DNA strand, and Boyer focuses on how the mutations in the enzyme help the virus to get rid of AZT after incorporation.

262. Second, Illumina's counsel omitted a key passage that teaches the exact opposite of what Illumina's counsel ascribed to Boyer (*i.e.*, that AZT "overstuffs" the active site of the polymerase ***during incorporation*** thereby teaching away from azidomethyl): Boyer explicitly states that "**[t]he azido group of AZT appears to not interfere substantially with the binding of AZT[triphosphate] at the N site or its incorporation into DNA.**" Ex. S at 4839 (emphasis added). This omitted passage teaches that the azide of AZT does "not interfere substantially" with AZT's "incorporation of into DNA," thereby demonstrating that Illumina's suggestion that the azide of AZT "overstuffs" the active site of the polymerase during incorporation is false. Thus, Boyer does not teach that the azide of AZT causes steric problems during incorporation, as suggested by Illumina; rather, Boyer explicitly teaches that AZT is readily incorporated with minimal steric inhibition.

263. Third, the passage cited by Illumina's counsel, *i.e.*, the description of Fig. 3 in Boyer describing a steric clash between AZT and the enzyme active site, is ***wholly irrelevant*** to the process of nucleotide incorporation because it refers to an AZT molecule ***which had already been incorporated*** into a growing nucleic acid strand. Ex. S at 4838. Illumina misrepresented the teachings of Boyer by citing this passage and suggesting that the steric clash described in Boyer was relevant to the incorporation process required by the challenged claims. Rather, the passage cited by Illumina discusses steric interactions that occur well ***after*** incorporation is completed, and is not relevant to the incorporation process required by the patent claims.

264. Moreover, the quoted description of Fig. 3 refers to steric conflict in the "P site," or "priming site" that holds the growing nucleic acid, which Boyer contrasts with the "N site," or "nucleotide binding site" that holds the incoming nucleotide during incorporation. Ex. S at 4838 (Fig. 3), 4833 (defining these two active sites). Illumina's counsel misleadingly conflated these two active sites, describing them as one. *See* Ex. K at 37. Boyer teaches that there is a steric clash at the "P site"—after AZT has already been incorporated—but there is no such steric clash at the "N site" that affects the incorporation process.

265. Thus, Illumina deceptively used Boyer's disclosure of post-incorporation steric conflict at the "P site" to argue that a person of ordinary skill would believe that the 3'-O-azidomethyl group claimed by the '537 Patent would interfere with the "active site" of the polymerase, preventing incorporation, because azidomethyl is larger than the azide of AZT. This argument (1) intentionally omitted the fact that the described steric conflict at the "P site" occurs post-incorporation, (2) intentionally omitted the important distinction between the "P site" and the "N site" of the polymerase, and (3) intentionally omitted Boyer's specific teaching that "[t]he azido group of AZT appears to not interfere substantially with the binding of AZT[triphosphate] at the N site or its incorporation into DNA." *See* Ex. S at 4839.

266. Illumina's expert, Dr. Romesberg, made the same or similar misrepresentations in support of Illumina's Patent Owner Preliminary Response. *See* Ex. L at ¶¶ 29-31.

267. Each of Messrs. Taylor, Fuller, and Luman, and Dr. Romesberg, thoroughly reviewed and studied the Boyer reference in drafting Illumina's Patent Owner's Preliminary

Responses and supporting declarations. Given their high academic achievement in the relevant sciences, and Dr. Romesberg's industry expertise, these individuals would have known that their characterization of Boyer was false and misleading. They would have understood that Boyer describes post-incorporation steric conflict and would have understood the difference between the two different active sites of Boyer's polymerase. Indeed, so much can be ascertained by simply reading Boyer. Nonetheless, these individuals made these affirmative misrepresentations with the intent of deceiving the PTAB. Moreover, Messrs. Taylor, Fuller, and Luman did not perform their sworn duty of candor and good faith in dealing with the PTAB.

268. Dr. Romesberg and Illumina's counsel's intentional misrepresentations regarding the teachings of Boyer with respect to the sterics of AZT were material to the PTAB's denial of institution of CGI's IPRs.[13] As evidence, the PTAB specifically quoted Boyer and used it to

[13] Illumina's mischaracterization of Boyer was not the only misrepresentation made by Illumina with respect to the polymerase active site. In Illumina's Patent Owner Preliminary Response in IPR2017-02174, Illumina's counsel falsely asserted that "specific evidence from the scientific literature" taught that the azide in the azidomethyl group was "expected to react with nucleophiles within the localized environment of the polymerase active site." Ex. K at 47; *see also id*. at 47-49. Yet, in the prior IPR, Dr. Romesberg admitted in deposition that the ***only*** support for this assertion was a single speculative statement in a 1995 paper by Canard, he knew of no other evidence to support this argument, and the Canard paper itself provides absolutely ***no evidence*** of such reactivity. *See* Ex. E at 85:7-86:8; *see also* Ex. T (B. Canard, et al., *Catalytic Editing Properties of DNA Polymerases*, 92 PROC. NATL. ACAD. SCI. USA 10859-10863 (1995)) at 10863. Dr. Romesberg even admitted that he would be "suspicious" of Carnard's speculation because it did not accurately represent known the chemical reactivity of azides. Ex. E at 81:21-82:12. Furthermore, Canard's speculation is based on reports of AZT being metabolized to the 3'-amino analogue. Ex. T at 10863. It was widely reported prior to 2002 that this metabolism was caused by oxidative enzymes in the liver, with no mention of polymerase reactivity. *See*, *e.g.*, Ex. U (S. Fayz & T. Inaba, *Zidovudine Azido-Reductase in Human Liver Microsomes: Activation by Ethacrynic Acid, Dipyridamole, and Indomethicin and Inhibition by Human Immunodecifiency Virus Protease*, 42 ANTIMICROBIAL AGENTS & CHEMOTHERAPY 1654-1658 (1998)); Ex. V (E.M. Cretton et al., *Catabolism of 3'-Azido-3'-deoxythymidine in Hepatocytes and Liver Microsomes with Evidence of formation of 3'-Amino-3'-deoxythymidine, a Highly Toxic Catabolite for Human Bone Marrow Cells*, 39 MOL. PHARMACOL. 258-266 (1990)); Ex. W (X.-R. Pan Zhou, et al., *Role of Human Liver P450s and Cycochrome b5 in the Reductive Metabolism of 3'-Azido-3'-deoxythymidine (AZT) to 3'-Amine-3'-deoxythymidine*, 55 Biochem. Pharmacol. 757-766 (1998)). Nevertheless, Illumina reasserted this mischaracterization of the prior art to the PTAB in IPR2017-02174.

conclude that Boyer's disclosure would lead a person of ordinary skill in the art to expect azidomethyl to be too "bulky" for incorporation:

> More specifically, Patent Owner cites Boyer's study in 2001, finding:
>
> > when AZT is incorporated, the AZT interferes with the formation of the closed ternary complex [of the polymerase]. We believe that the problem is steric and that the large azido group interferes with either the ability of AZT to occupy the P [portion of the active] site, or the ability of the incoming dNTP to enter the N [portion of the active] site, or both.
>
> Thus, while some polymerases might incorporate AZT, the size and steric bulk of the N_3 moiety alone is described as fully occupying the enzyme active site. Ex. 2024, ¶ 29. Petitioner does not explain adequately why, at the time of the invention, the larger azidomethyl moiety (which includes, in addition to the three linear nitrogen atoms, an extra oxygen, carbon, and two hydrogen atoms) would have been expected to fit within the active site.

Ex. R at 34-35.

269. But for these intentional misrepresentations by Illumina's expert and counsel, alone, or in combination with the other misrepresentations identified herein, CGI's IPRs would have been instituted, and the '537 Patent would have been invalidated.

270. The foregoing facts demonstrate that Dr. Romesberg, as well as Illumina's counsel, Messrs. Taylor, Fuller, and Luman, and possibly others, knowingly and deliberately made material misrepresentations to the PTAB with the specific intent to deceive. This is the single most reasonable inference from these facts.

271. These facts also demonstrate that Dr. Romesberg, as well as Illumina's counsel, Messrs. Taylor, Fuller, and Luman, and possibly others, engaged in affirmative egregious misconduct towards the PTAB and the PTO.

False Statements Regarding Cleavage of the Phosphate-Ester-Backbone of DNA by Amines

272. On January 23, 2018, Illumina's counsel, Kerry S. Taylor, Michael L. Fuller, and Nathanael R. Luman filed Illumina's Patent Owner Preliminary Response in two IPRs filed by CGI. *See* Exs. J, K. In these Patent Owner Preliminary Responses Illumina's counsel made false

statements regarding the cleavage of DNA's phosphate-ester-backbone by amino groups attached to nucleotides.

273. The individual nucleotides that compose a strand of DNA, or other nucleic acids, are connected *together* by what is referred to as a "phosphate-ester-backbone," or phosphodiester linkage. This phosphate-ester-backbone connects the 3' carbon of one nucleotide's 5-carbon sugar to the 5' carbon of the next nucleotide's 5-carbon sugar. This is exemplified below in **Figure 2**.

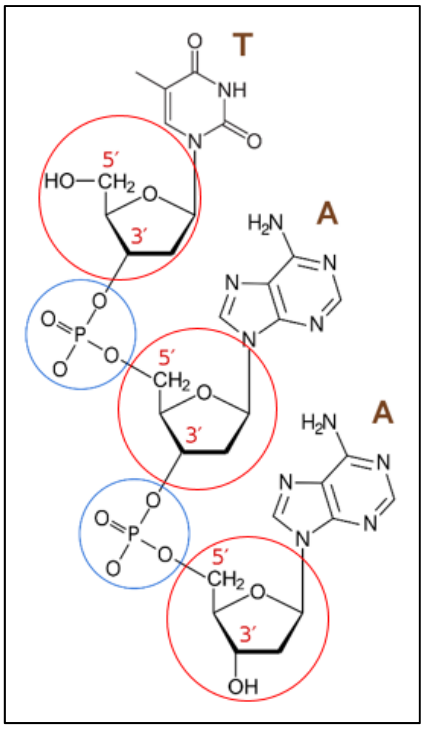


Figure 2: Phosphate-ester-backbone. Phosphodiester groups circled in blue; sugars circled in red with 3' and 5' carbons labeled.

274. In opposing CGI's IPRs regarding the '537 Patent, Illumina's counsel, Messrs. Taylor, Fuller, and Luman, argued that there was no motivation in the art to use an azidomethyl group, as required by claims of the '537 Patent, because removal of the azidomethyl group, which is also required by the '537 Patent, would produce an intermediate containing an amino group, *i.e.*, -NH_2, which would cleave the phosphate-ester-backbone of DNA, degrading the nucleic acid strand in question. Specifically, Illumina's counsel stated that "[e]vidence available at the time of

Illumina's invention indicated that this amine formation would not have been expected to be mild for Dower's SBS method because **nucleotides having amino groups were taught as undergoing an intramolecular reaction that spontaneously attacks and cleaves the phosphate ester backbone of DNA.**" *See* Ex. K at 42; *see also* Ex. J at 47 (same). Illumina's counsel thereafter mischaracterized a reference, Stanton,[14] stating that its disclosure would discourage the use of the 3'-O-azidomethyl group, as required by the '537 Patent, because Stanton "explains that the amine group formed by the reaction of a phosphine with an azido group would cleave the phosphate ester backbone of DNA, which would degrade DNA." Ex. K at 43. Illumina's counsel then concluded that "***[i]t therefore stands unrebutted that phosphine deblocking of an azidomethyl group was expected to cleave the backbone phosphate ester linkages in DNA, which would not have motivated a POSITA to use an azidomethyl group because it would not have been expected to meet Dower's "mild" deblocking criteria.*** A POSITA would have been discouraged from using an azidomethyl group due to this evidence of cleavage of the DNA backbone." *Id.* (emphasis in original).

275. Illumina's counsel's characterization and resulting conclusion is plainly false and misleading, which Messrs. Taylor, Fuller, and Luman would have known from thoroughly reviewing Stanton, in addition to other exhibits which they cited in Illumina's Patent Owner Preliminary Response that support the opposite conclusion.

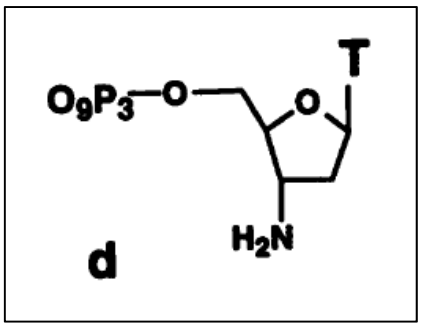
276. First, Illumina's counsels' quotation from Stanton misleadingly omitted the reference to "(Scheme 11)," which refers to a series of figures on the following page of Stanton. *Compare id.* at 43 (Illumina's POPR), *with* Ex. X at 85 (including the words "(Scheme 11)," in the same passage which Illumina's counsel "quoted."). Counsels' deliberate omission of this reference from its quotation of Stanton is deceptive because a review of Scheme 11 shows amino groups *attached to either the 2' or 4' carbon* cleaving the phosphodiester linkage which connects the *3' carbon to the next nucleotide* (*see* Ex. X at 85-86); it does not show any examples where an

[14] Vincent P. Stanton, et al., WO 02/21098 A2 (published Sept. 5, 2000), hereinafter "Stanton," attached hereto as Ex. X.

amino group *attached to the 3' carbon* cleaves the phosphodiester linkage between the *5' carbon and the previous nucleotide*, as Illumina's counsel suggested. Moreover, while Stanton discloses scores of molecules specifically designed for effecting the site-specific cleavage of the phosphate-ester-backbone of DNA through a variety of mechanisms, it does not disclose a single example where a 3' amino group cleaves the linkage leading to the previous nucleotide, as Illumina's counsel argued.

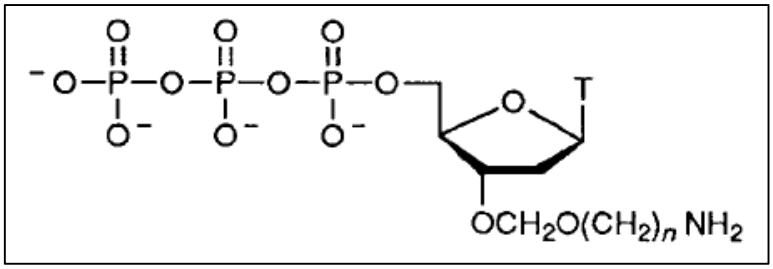
277. This mischaracterization of Stanton is critical. From a simple review of Stanton, Illumina's counsel would have known that its disclosure was being mischaracterized, and indeed deliberately mischaracterized it with the specific intent of deceiving the PTAB, as evidenced by Illumina's deliberate omission of the words "(Scheme 11)" while quoting Stanton.

278. Second, several exhibits which Illumina's counsel cited in the Patent Owner Preliminary Response demonstrated successful incorporation of nucleotide analogues having amino groups attached to the 3' carbon, none of which reported cleavage of the phosphate-ester-backbone. These exhibits thus disclosed exactly what counsel argued Stanton taught away from. For example, Illumina's counsel cited to Canard which demonstrated the incorporation of a nucleotide having an amino group at the 3' position, and reported no cleavage of the phosphate-ester-backbone. *See, e.g.*, Ex. K at 47 (citing Canard); *see* Ex. T at, *e.g.*, 10862 ("FIG. 5. Incorporation of 3'-amd-dTTP and 3'-NH_2-dTTP."). Moreover, Canard included the following figure, clearly depicting a nucleotide with a 3' amino (*i.e.*, NH_2) group, which Illumina's counsel would have seen during their study of Canard.



Ex. T at 10860.

279. Illumina's counsel also cited Hovinen,[15] which similarly demonstrated incorporation of nucleotides having 3' amino groups, and likewise reported no cleavage of the phosphate-ester-backbone. *See, e.g.*, Ex. K at 33-34 (citing Hovinen); *see* Ex. Y at, *e.g.*, 213 ("It is clearly seen that **3'-O-(*ω*-amino**alkoxymethy1)thymidine 5'-triphosphates 10a-c as well as their analogues [incorporate]." (emphasis added)). Hovinen also included the following diagram of what it labeled molecules 10a-c, containing a 3' amino (*i.e.*, NH_2) group, which Illumina's counsel would have seen during their study of Hovinen.

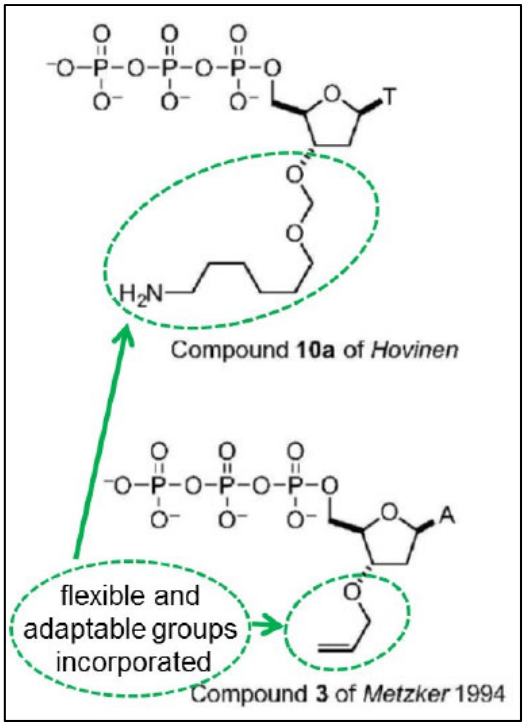


Ex. Y at 212. Molecules 10a-c are three different modified nucleotides, each having an amine-containing group at the end of alkoxymethyl arms of different lengths attached at the 3' position. *Id*. Each of these molecules was shown to be incorporated by Hovinen. *Id*. at 213.

280. Moreover, Illumina's counsel even highlighted one of Hovinen's 3'-amino containing nucleotides in the Patent Owner Preliminary Response, inserting an annotated diagram of this nucleotide.[16]

[15] J. Hovinen, et al., *Synthesis of 3'-O-(ω-Aminoalkoxymethyl)thymidine 5'-Triphosphates, Terminators of DNA Synthesis that Enable 3'-Labelling*, 1 J. CHEM. SOC. PERKIN TRANS. 211-217 (1994), hereinafter "Hovinen," attached hereto as Ex. Y.

[16] Illumina's counsel similarly relied on M.L. Metzker, et al., *Termination of DNA synthesis by novel 3'-modified-deoxyribonucleoside 5'-triphosphates*, 22 NUCLEIC ACIDS RES. 4259-4267 (1994) (attached hereto as Ex. Z), which discloses the attempted incorporation of 2'-Deoxy-3'-O-(2-aminobenzoyl)adenosine-5'-triphosphate, another compound having an amine-containing group at the 3'-position of a nucleotide. Although Metzker does not report successful incorporation of this group, Metzker's reported attempt undermines Illumina's assertion that one of skill would be discouraged from using compounds having amine-containing groups at the 3'-position because they expect amines at the 3'-position to cleave the DNA backbone.



See Ex. K at 34.

281. As shown, Illumina's counsel repeatedly cited to these, and other references which clearly disclosed the incorporation of nucleotides containing 3' amino groups, none of which reported cleavage of the phosphate-ester-backbone of DNA. Given their high academic achievement and thorough review of Stanton and these other references, Illumina's counsel clearly knew that their characterization of Stanton was misleading and that their ensuing arguments were false and unsupported. Nonetheless, Illumina's counsel, Kerry S. Taylor, Michael L. Fuller, and Nathanael R. Luman, made these false representations and arguments with the specific intent of affirmatively misleading the PTAB. Messrs. Taylor, Fuller, and Luman did not perform their sworn duty of candor and good faith in dealing with the PTAB.

282. Tellingly, this argument regarding Stanton and the alleged cleavage of the phosphate-ester-backbone by nucleotides containing 3'-amino groups is not supported by a declaration from Illumina's expert, suggesting that this deceptive and clearly false argument was conceived of by Illumina's counsel. The fact that Illumina's argument was not supported by expert testimony is further evidence that Illumina's counsel knew of its falsity, but proceeded anyway with the specific intent of deceiving the PTAB.

283. Illumina's counsel's intentional misrepresentations about Stanton's disclosure and the cleavage of the phosphate-ester-backbone by 3'-amino groups were material to the PTAB's denial of institution of CGI's IPR. As evidence, these misrepresentations were specifically cited by the PTAB in its Decision Denying Institution:

> And, even as to this less effective treatment, ***Patent Owner provides evidence that phosphine deblocking conditions produce amines that can harm DNA molecules.*** [citing Stanton].
>
> ***
>
> Petitioner proposes it would have been obvious to use TCEP (tris(2-carboxyethyl)-phosphine)as the reducing agent. Patent Owner, however, presents argument and evidence to the contrary. Citing Stanton, Patent Owner argues "***the amine group formed by the reaction of a phosphine with an azido group would cleave the phosphate ester backbone of DNA.***" Prelim. Resp. 43. More specifically, Stanton teaches: [quoting Stanton].
>
> ***
>
> On this record, we are persuaded this evidence is yet another factor that would have discouraged the ordinarily skilled person from pursuing the modification of the prior art proposed by Petitioner…

See, e.g., Ex. R at 32-33 (emphasis added).

284. But for these intentional misrepresentations by Illumina's counsel, alone, or in combination with the other misrepresentations identified herein, CGI's IPRs would have been instituted, and the '537 Patent would have been invalidated.

285. The foregoing facts demonstrate that Illumina's counsel, Messrs. Taylor, Fuller, and Luman, and possibly others, knowingly and deliberately made material misrepresentations to the PTAB with the specific intent to deceive. This is the single most reasonable inference from these facts.

286. These facts also demonstrate that Illumina's counsel, Messrs. Taylor, Fuller, and Luman, and possibly others, engaged in affirmative egregious misconduct towards the PTAB and the PTO.

TWELFTH DEFENSE – UNCLEAN HANDS

287. Illumina's claims are barred, in whole or in part, by the doctrine of unclean hands.

288. As identified above with respect to Defendants Eleventh Affirmative Defense of Inequitable Conduct (¶¶ 217-286), which are incorporated herein by reference, Illumina, Illumina's counsel, and Illumina's retained experts have engaged in egregious misconduct while defending the validity of the '537 Patent.

289. This egregious misconduct has an immediate and necessary relation to the equity that Illumina seeks with respect to the present litigation because the egregious misconduct was committed while defending the validity of the '537 Patent, which would have been invalidated but for this egregious misconduct. Thus, but for Illumina's egregious misconduct, the '537 Patent, and the '200 Patent, which is terminally disclaimed to the '537 and is nearly verbatim identical, would be invalid, and could therefore not be asserted against Defendants. Illumina's egregious misconduct also has a necessary and immediate relation to the equity that Illumina seeks with respect to the present litigation because it has enhanced Illumina's position with respect to the legal rights of this litigation.

RESERVATION OF ALL AFFIRMATIVE DEFENSES

290. Defendants reserve the right to offer any other and additional defense that is now or may become available or appear during, or as a result of, discovery proceedings in this action.

COUNTERCLAIMS

Complete Genomics, Inc. ("CGI" or "Counterclaim-Plaintiff") asserts the following allegations and counterclaims against Illumina, Inc. and Illumina Cambridge Ltd. (collectively, "Illumina" or "Counterclaim-Defendants").

THE COUNTERCLAIM PARTIES

1. Counterclaim-Plaintiff CGI is a privately held research company with its principal place of business at 2904 Orchard Way, San Jose, California 95134.

2. CGI is incorporated under the laws of the State of Delaware.

3. Defendant Illumina, Inc. is a Delaware corporation with its principal place of business at 5200 Illumina Way, San Diego, California 92122.

JURISDICTION AND VENUE

4. This Court has personal jurisdiction over Illumina because it initiated the present lawsuit. Moreover Illumina has numerous offices and employees in California, including in this District, and has filed previous litigation in this Court. Upon information and belief, Illumina has systematic and continuous contacts in this judicial district, regularly transacts business within this district, and regularly avails itself of the benefits of this District. Upon information and belief, Illumina also sells, distributes, and supports accused products (and products for practicing accused methods) as well as practices the accused methods in this District and derives substantial revenues from sales in this District.

5. This action arises under the patent laws of the United States of America, 35 U.S.C. § 1, et seq. This Court has federal question jurisdiction under 28 U.S.C. § 1331 and 28 U.S.C. § 1338(a) because this is a civil action arising under the patent laws of the United States.

6. Venue is proper in this District under 28 U.S.C. §§ 1391(b) and 1400(b) because Illumina is subject to personal jurisdiction in this District, CGI has suffered and continues to suffer harm in this District, and it is a convenient forum for resolution of the Parties' dispute set forth in these Counterclaims.

FACTUAL BACKGROUND

THE '984 PATENT

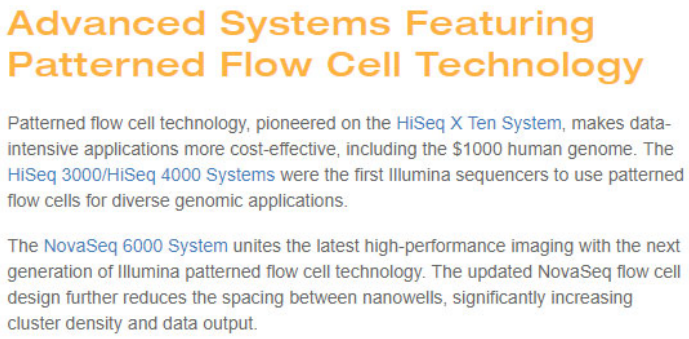
7. On April 17, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 9,944,984 (hereinafter the "'984 Patent"), titled "Methods and Compositions for Efficient Base Calling in Sequencing Reactions." The named inventors of the '984 Patent are Radoje Drmanac, Matthew J. Callow, Snezana Drmanac, Brian K. Hauser, and George Yeung. The '984 Patent is attached hereto as Ex. AA (U.S. Patent No. 9,944,984).

8. By assignment, CGI obtained the entire right, title, and interest to and in the '984 Patent.

INFRINGEMENT OF THE '984 PATENT

A. Direct Infringement of the '984 Patent

9. Illumina sells DNA sequencing systems that it describes as "advanced systems featuring patterned flow cell technology." As shown below, these systems include at least the NovaSeq 6000 system, the HiSeq X Ten system, the HiSeq 3000 system and the HiSeq 4000 system.



See Ex. BB (Patterned Flow Cells, https://www.illumina.com/science/technology/next-generation-sequencing/sequencing-technology/patterned-flow-cells.html). Illumina also sells "Reagent Kits" to be used with the NovaSeq 6000 system, the HiSeq X Ten system, the HiSeq 3000 system, and the HiSeq 4000 system. Each of the Reagent Kits sold for use with these systems includes patterned flow cells for use during sequencing.

10. For example, Illumina sells the following reagent kits for use with the NovaSeq 6000 system: the NovaSeq S1 Reagent Kit, the NovaSeq S2 Reagent Kit, the NovaSeq S4 Reagent Kit, and the NovaSeq SP Reagent Kit (hereinafter "NovaSeq Reagent Kits"). Ex. CC (Reagent Kits for NovaSeq 6000). Each of these NovaSeq Reagent Kits contains a unique flow cell specifically designed for use with the NovaSeq 6000, known respectively as the S1, S2, S4, and SP flow cells (hereinafter "NovaSeq Flow Cells"). *Id*. Each of these NovaSeq Flow Cells are patterned flow cells that, when used as intended, generate arrays that infringe at least claims 1-3 and 5 of the '984 Patent.

11. In addition, the following reagent kits are designed for use with the HiSeq 3000 and HiSeq 4000 systems: the HiSeq 3000/4000 PE Cluster Kit, the HiSeq 3000/4000 SR Cluster Kit, and the HiSeq 3000/4000 SBS Kit (hereinafter "HiSeq 3000/4000 Kits"). Ex. DD (HiSeq

3000/4000 Reagent Kits, https://www.illumina.com/products/by-type/sequencing-kits/cluster-gen-sequencing-reagents/hiseq-3000-4000-sbs-kit.html). The HiSeq X Ten Reagent Kit v2.5 is marketed for use with the HiSeq X system. Ex. EE (HiSeq X Reagent Kits, https://www.illumina.com/products/by-type/sequencing-kits/cluster-gen-sequencing-reagents/hiseq-x-hd-kits.html). Each of these reagent kits comprise patterned flow cells that, when used as intended, generate arrays that infringe at least claims 1-3 and 5 of the '984 Patent.

12. Moreover, Illumina offers a program in the United States that it calls "FastTrack Sequencing" in which Illumina will perform the sequencing of samples provided by its customers. Ex. FF (FastTrack Sequencing, https://www.illumina.com/services/sequencing-services.html) ("Illumina FastTrack Services provides a number of sequencing service packages, including cancer analysis and whole-genome sequencing services."). Illumina performs its "FastTrack Sequencing" services on HiSeq X machines using TruSeq sample preparation kits. *See* Ex. GG (FastTrack Sequencing: Technology, https://www.illumina.com/services/sequencing-services/technology.html); Ex. HH (Technical Support Note Fast Track Sequencing, https://www.illumina.com/content/dam/illumina-marketing/documents/services/FastTrackServices_Methods_Tech_Note.pdf) ("Illumina FastTrack Human Whole-Genome Sequencing (WGS) Service is powered by the HiSeq X™ System[.]"). FastTrack Sequencing also uses HiSeq X reagent kits. *Id*. ("Sequencing runs are performed based on the *HiSeq X System Guide*, using HiSeq X reagent kits."). The HiSeq X System Guide indicates that the HiSeq X system uses patterned flow cells. Ex. II (HiSeq X System Guide, https://support.illumina.com/content/dam/illumina-support/documents/documentation/system_documentation/hiseqx/hiseq-x-system-guide-15050091-07.pdf) at 7 ("The HiSeq X uses a patterned flow cell with billions of ordered nanowells[.] . . . The patterned flow cell is provided in the HiSeq X Reagent Kit v2.5."). Thus, Illumina directly infringes claims 1-3 and 5 of the '984 Patent when performing sequencing services as part of their "FastTrack Sequencing" services.

1. Infringement Analysis for Claims 1-3 and 5 of the '984 Patent

a. Infringement of Claim 1 of the '984 Patent

13. Claim 1 of the '984 Patent recites:

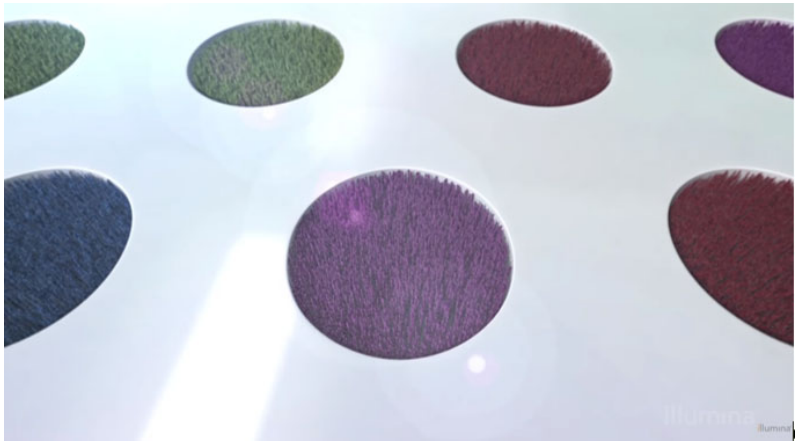
> A high density DNA array comprising
> a patterned surface, said surface comprising a pattern of DNA binding regions separated by a non-DNA binding surface, and
> more than 10^5 different DNAs comprising genomic sequences bound on the array at the DNA binding regions
> wherein the DNA binding regions comprise oligonucleotides for binding the DNAs within the DNA binding regions and all of the DNA binding regions of the array comprise the same oligonucleotides, and
> wherein:
> the density of the DNA binding regions on the array is more than 100,000 per mm^2,
> more than 50% of the DNA binding regions in the array have multiple copies of one single DNA of said more than 10^5 different DNAs,
> the sequence of the single DNA at each DNA binding region is not known, and
> the array is not a bead array.

14. As discussed above, the normal and intended use of the NovaSeq 6000, the HiSeqX, and the HiSeq 3000/4000 systems with their respective reagent kits infringes the '984 Patent. The following is a detailed exemplary analysis of how the '984 Patent is infringed during the normal and intended use of the NovaSeq 6000 with the NovaSeq Reagent Kits. In addition, the normal and intended use of the HiSeq X and HiSeq 3000/4000 systems with their respective reagent kits also infringes the '984 Patent.

a. **"A high density DNA array comprising"**

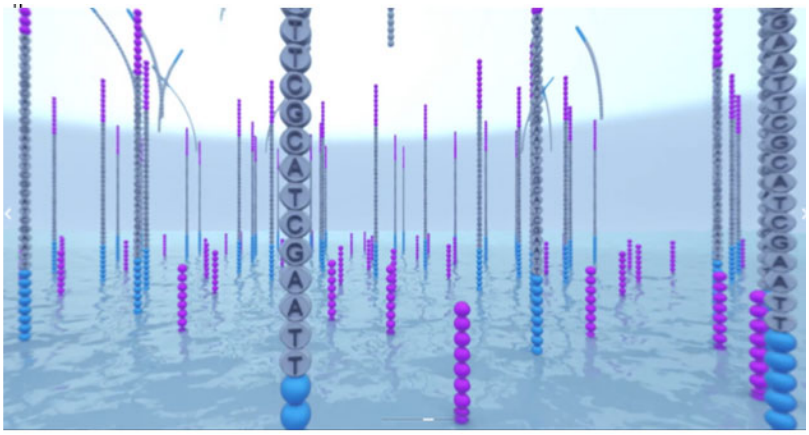
15. On information and belief, during the intended use of the NovaSeq 6000 Sequencing System with the NovaSeq Reagent Kits, a high density DNA array is generated. On information and belief, the intended use of the NovaSeq 6000 Sequencing System with the NovaSeq Reagent Kits results in a plurality of clusters of DNA immobilized on the surface of the array (either directly bound to the substrate of the flow cell or indirectly bound to the substrate of the flow cell (*e.g.*, via a polymer coating on the substrate)). Each DNA cluster comprises a

plurality of identical copies of oligonucleotides. These DNA clusters are spatially localized within nanowells on the flow cell surface. On information and belief, the Patterned Flow Cell Technology video depicts a patterned flow cell having a plurality of different DNA clusters directly or indirectly bound to the surface of a flow cell, with each cluster localized within a nanowell:



Ex. JJ (Patterned Flow Cell Video https://www.illumina.com/company/video-hub/pfZp5Vgsbw0.html) at 1:23-1:31. On information and belief, for most, if not all, of the DNA clusters, each cluster comprises at least a dominant plurality of identical nucleic acids, [17] directly or indirectly bound to the surface of the flow cell. This is depicted in the "NovaSeq System Explorer" video, as shown below.

[17] On information and belief, many of the clusters in Illumina's patterned flow cells comprise only one set identical nucleic acids having a genomic sequence. However, due to several factors (*e.g.*, PCR error during bridge amplification and/or introduction of a second genomic strand during bridge amplification), some clusters may comprise two or more sets of nucleic acids having genomic sequences, with one dominant population from which the sequence is deduced. Even in this case, such clusters comprise a plurality of identical nucleic acids, as required by claim 1.



Ex. KK (NovaSeq System Explorer Video, https://www.illumina.com/systems/sequencing-platforms/novaseq/system-explorer.html). The excerpt above depicts a single nanowell on a NovaSeq flow cell during the intended operation of a NovaSeq 6000 sequencer. The excerpt above depicts the nanowell as having a plurality of identical DNA strands directly or indirectly bound to the array of the flow cell. This plurality of identical, immobilized nucleic acids comprises one "DNA cluster." The Illumina "Introduction to Next-Generation Sequencing Technology" provides the following definition for "cluster":

> A clonal grouping of template DNA bound to the surface of a flow cell. ***Each cluster is seeded by a single template DNA strand*** and is clonally amplified through bridge amplification until the cluster has ~1000 copies. Each cluster on the flow cell produces a single sequencing read.

Ex. LL (Introduction to Next Generation Sequencing, https://www.illumina.com/documents/products/illumina_sequencing_introduction.pdf) at 14.

16. Furthermore, the NovaSeq Sequencing System brochure describes the flow cells compatible with the NovaSeq system in the following manner:

> The redesigned NovaSeq flow cells improve upon patterned flow cells first deployed on the HiSeq X System. Each flow cell contains billions of nanowells at fixed locations for even cluster spacing and uniform feature size. ***NovaSeq flow cells reduce spacing between nanowells, significantly increasing cluster density***. Combining the higher cluster density with proprietary exclusion amplification clustering maximizes the number of nanowells occupied by DNA

> clusters originating from a single DNA template for a substantial increase in data output.

Ex. MM (NovaSeq™ 6000 Sequencing System, https://www.illumina.com/content/dam/illumina-marketing/documents/products/datasheets/novaseq-6000-system-specification-sheet-770-2016-025.pdf) at 3. Thus, on information and belief, the intended use of the NovaSeq 6000 with the NovaSeq Flow Cells found in the NovaSeq Reagent Kits leads to the formation of a high-density DNA array.

17. Similarly, the intended use of the HiSeq X and HiSeq 3000/4000 systems with their respective reagents kits leads to the formation of a high-density DNA array.

b. **"a patterned surface, said surface comprising a pattern of DNA binding regions separated by a non-DNA binding surface, and"**

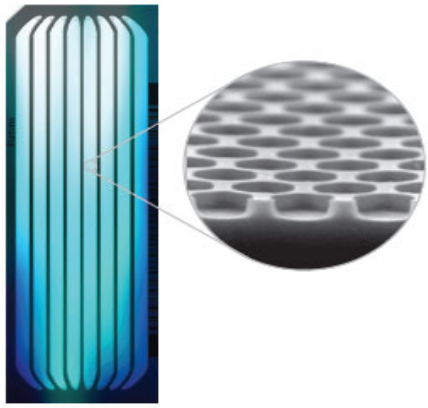
18. On information and belief, the high-density DNA array generated by the intended use to the NovaSeq 6000 comprises a patterned surface, with the patterned surface comprising a pattern of DNA binding regions separated by a non-DNA binding surface. The NovaSeq System Guide reinforces this understanding of the structure and functionality of the NovaSeq Flow Cells:

> The NovaSeq 6000 flow cell is a patterned flow cell encased in a cartridge. ***The flow cell is a glass-based substrate containing billions of nanowells in an ordered arrangement,*** which increases the number of output reads and sequencing data. ***Clusters are generated in the nanowells*** from which sequencing is then performed.
>
> Each flow cell has multiple lanes for sequencing pooled libraries. The SP, S1,and S2 flow cells have two lanes each, and the S4 flow cell has four. Each lane is imaged in multiple swaths, and the software then divides the image of each swath into smaller portions called tiles.

Ex. NN (NovaSeq 6000 System Guide, http://jp.support.illumina.com/content/dam/illumina-support/documents/documentation/systemex. documentation/novaseq/novaseq-6000-system-guide-1000000019358-09.pdf) at 12. Thus, on information and belief, each of the SP, S1, S2, and S4 flow cells comprise a patterned surface having DNA binding regions (*i.e.*, nanowells in which

clusters are generated) arranged in an ordered manner and separated by a non-DNA-binding region of the flow cell surface (*i.e.*, the regions between nano-wells).

19. The "Technology Spotlight: Patterned Flow Cell Technology" brochure, also available on Illumina's website provides an informative diagram that depicts the surface of a patterned flow cell:



Ex. OO (Tech Spotlight: Patterned Flow Cell Technology, https://www.illumina.com/content/dam/illumina-marketing/documents/products/technotes/patterned-flow-cell-technology-technical-note-770-2015-010.pdf) at 1. The right side of the image depicts the surface found in the lanes of patterned flow cells, such as the NovaSeq Flow Cells. This diagram shows the nanowell regions in the flow cell surface, as well as the interstitial region of the flow cell surface surrounding each nanowell. This brochure states that "[p]atterned flow cells contain billions of nanowells at fixed locations, providing even cluster spacing and uniform feature size to deliver extremely high cluster densities." *Id.* Thus, the surface of each of the NovaSeq Flow Cells comprises an ordered arrangement of nanowells, where DNA can bind. Further, the surface of each of the NovaSeq Flow Cells comprises regions that separates each nanowell where DNA cannot bind.

20. The brochure emphasizes several problems with traditional (*i.e.*, non-patterned) flow cells and explains how the patterned flow cells overcome these problems:

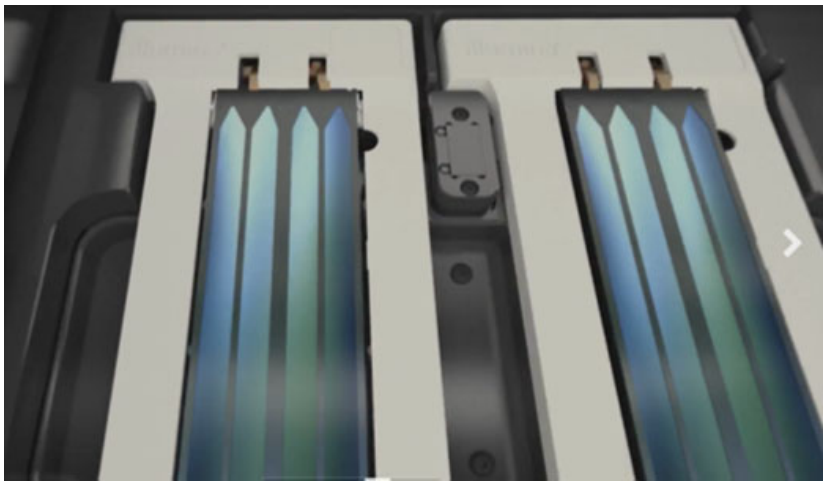
> Patterned flow cell technology overcomes these challenges with prearranged nanowells that optimize cluster spacing. ***Clusters can only form in the nanowell***s, making the flow cells less susceptible to overloading. ***New patented chemistry allows simultaneous seeding and amplification during cluster generation to minimize the chances of multiple library fragments amplifying as a single cluster.***

Ex. OO at 1. The brochure also explains Illumina's method of producing the patterned surface and how this method of production results in DNA-binding regions exclusively located within the nanowells:

> Patterned flow cells are produced using semiconductor manufacturing technology. Starting with a glass substrate, patterned nanowells are etched into the surface. ***Each nanowell contains DNA probes used to capture prepared DNA strands for amplification during cluster generation***. ***The area between the nanowells is devoid of DNA probes, preventing the formation of clusters in the interstitial regions between wells***. This process ensures that DNA clusters only form within the nanowells, providing even, consistent spacing between adjacent clusters and allowing accurate resolution of clusters during imaging. The result is maximal use of the flow cell surface leading to overall higher clustering.

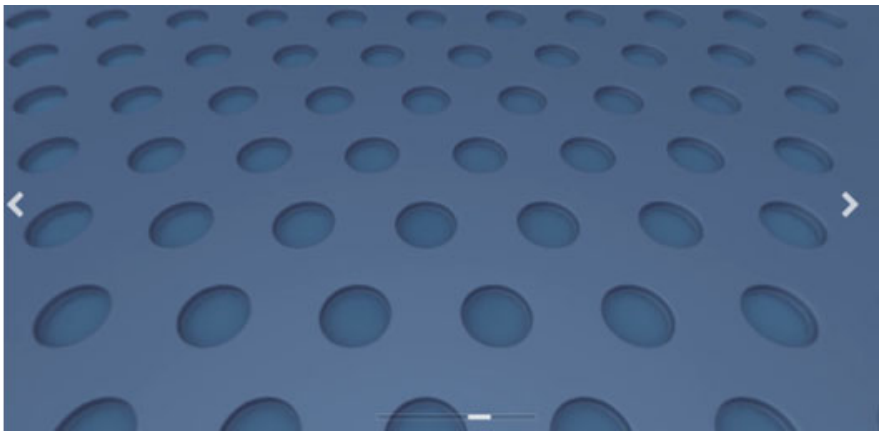
Id. On information and belief, the normal and intended use of the NovaSeq sequencer with the NovaSeq Flow Cells does not result in immoblized nucleic acids in the area of the flow cells surrounding the nanowells.

21. Illumina's NovaSeq System Explorer video depicts a NovaSeq Flow Cell within a NovaSeq 6000 sequencer.



Ex. KK; *see also* Ex. PP (NovaSeq VR video, https://www.illumina.com/company/video-hub/68oY5APcfJM.html) at 1:27.

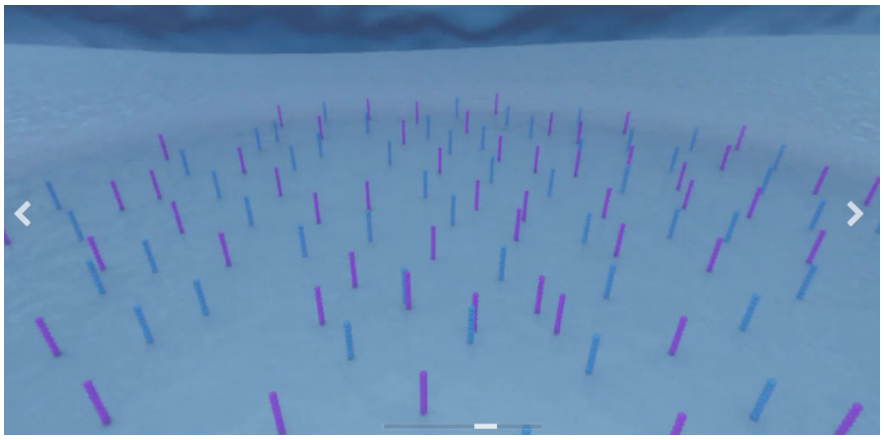
22. The excerpt from the video depicts the NovaSeq S4 flow cell, which uniquely comprises four lanes on each flow cell. The video depicts the surface of the flow cell, which is a patterned surface, as shown below:



Ex. KK; *see also* Ex. PP at 1:30-1:33.

23. The surface of the flow cell depicted in the "NovaSeq System Explorer Video" comprises a plurality of nanowells, indicated by the dark recesses in the flow cell surface. On information and belief, the flow cell comprises a glass-based substrate containing billions of nanowells in an ordered arrangement.

24. On information and belief, oligonucleotides are found within each nanowell of a NovaSeq Flow Cell. These oligonucleotides are directly or indirectly bound to the surface of the flow cell. This is depicted in the NovaSeq System Explorer video, which shows a plurality of oligonucleotides within a nanowell.



Ex. KK; *see also* Ex. PP at 1:33-1:35.

25. These oligonucleotides are necessary for binding sample DNA and generating DNA clusters. These oligonucleotides are not found in the interstitial region of the flow cell surface that separate the nanowells (*i.e.*, the regions between nano-wells). Thus, the NovaSeq Flow Cells comprise DNA-binding regions (*i.e.*, the nanowells) separated by a non-DNA binding surface (*i.e.*, the interstitial region of the flow cell surface). Ex. KK; *see also* Ex. PP.

26. For the same reasons, the patterned flow cells in the HiSeq X Reagent Kit v2.5 and the HiSeq 3000/4000 Reagent Kits also comprise DNA binding regions separated by a non-DNA binding surface.

c. "more than 10^5 different DNAs comprising genomic sequences bound on the array at the DNA binding regions"

27. As discussed above, during the intended use of the NovaSeq 6000 with any of the NovaSeq Reagent Kits, NovaSeq Flow Cells comprise a DNA array.

28. The NovaSeq Flow Cells comprise billions of nanowells. For example, the NovaSeq System Guide states that "[t]he flow cell is a glass-based substrate containing ***billions of nanowells*** in an ordered arrangement" and that "clusters are generated in the nanowells[.]" Ex. NN at 12 (emphasis added). Illumina's Technology Spotlight: Patterned Flow Cell Technology similarly states that "[p]atterned flow cells contain ***billions of nanowells*** at fixed locations, providing even cluster spacing[.]" Ex. OO at 1.

29. A vast majority of the clusters comprise a plurality of DNA molecules comprising a single genomic sequence (either as a homogenous population or a dominant population). For

example, in the "NovaSeq™ 6000 Sequencing System" brochure, Illumina advertises "proprietary exclusion amplification clustering [that] ***maximizes the number of nanowells occupied by DNA clusters originating from a single DNA template*** for a substantial increase in data output." Ex. MM at 3. Illumina claims that "new patented chemistry allows simultaneous seeding and amplification during cluster generation [and] ***minimize[s] the chances of multiple library fragments amplifying as a single cluster***." Ex. OO at 1.

30. The NovaSeq 6000 System Specification brochure provides the sequencing output per flow cell for each of the NovaSeq Flow Cells in Table 1:

Table 1: NovaSeq 6000 System flow cell specifications

Flow cell type	SP	S1	S2	S4
Lanes per flow cell	2	2	2	4
Output per flow cell[a,b]				
2 × 50 bp	65-80 Gb	134-167 Gb	333-417 Gb	N/A
2 × 100 bp	N/A	266-333 Gb	667-833 Gb	1600-2000 Gb
2 × 150 bp	200-250 Gb	400-500 Gb	1000-1250 Gb	2400-3000 Gb
2 × 250 bp	325-400 Gb	N/A	N/A	N/A
Single reads CPF	0.65-0.8 B	1.3-1.6 B	3.3-4.1 B	8-10 B
Paired-end reads CPF	1.3-1.6 B	2.6-3.2 B	6.6-8.2 B	16-20 B

a. Output and read number specifications based on a single flow cell using Illumina PhiX control library at supported cluster densities. The NovaSeq 6000 System can run one or two flow cells simultaneously.
b. **N/A** = not applicable, **CPF** = clusters passing filter.

Ex. MM at 2. Table 1 (above) provides that the SP flow cell, operated at supported cluster densities, generates 0.65-0.8 billion single reads from clusters passing filter. *Id*. As shown in Table 1, the number of "single reads" is doubled (1.3-1.6 billion) for paired-end reads because each cluster produces two single reads (*i.e.*, a forward read and a reverse-complement read) for each cluster during paired-end reading. As each SP flow cell has two lanes, the total number of clusters passing filter on each lane is approximately 325-400 million. The NovaSeq System Guide indicates that clusters are generated on only one surface of each flow cell lane. Ex. NN at 66.

31. As described above, each single fragment of target nucleic acid generates at most a single cluster and each cluster typically comprises one sequence from the sample nucleic acid. Nanowells that do not generate clusters will not produce a signal that passes the NovaSeq filter. Therefore, during the normal and intended use of the NovaSeq SP flow cell with the NovaSeq 6000 system, each lane of the flow cell comprises a surface with an array comprising more than 100,000 (10^5) DNAs having genomic sequences (*i.e.,* clusters). The entire glass flow cell likewise comprises a surface with an array comprising more than 100,000 (10^5) DNAs having genomic sequences, because each NovaSeq flow cell comprises more than one flow cell lane.

32. The normal and intended use of the other NovaSeq Flow Cells (*i.e.*, the S1, S2, and S4 flow cells) similarly generates arrays comprising more than 10^5 DNAs having genomic sequences. The table above demonstrates that each lane of these other NovaSeq Flow Cells has between 650 million clusters (S1 flow cell having 2 lanes) to 2.5 billion clusters (S4 flow cell having 4 lanes) at supported library densities. Ex MM at 2. During the use of each of these flow cells, clusters are generated on two surfaces of each flow cell lane (*i.e.*, the top and bottom surfaces). Thus, the use of these NovaSeq Flow Cells results in DNA arrays having between 325 million and 1.25 billion clusters per surface of each flow cell lane.

33. Thus, in light of the foregoing, on information and belief, during the normal and intended use of the NovaSeq 6000 with any of the NovaSeq Reagent Kits, NovaSeq Flow Cells comprise a DNA array having more than 10^5 (*i.e.*, 100,000) different DNAs comprising genomic sequences regardless of whether the array is defined as the entire flow cell or each lane of the flow cell.

34. The HiSeq 3000/4000 System Specification portion of Illumina's website also provides a table depicting the output data for the HiSeq 3000 and HiSeq 4000 systems:

Performance Parameters

	HiSeq 3000 System	HiSeq 4000 System
No. of Flow Cells per Run	1	1 or 2
Data Yield - 2 × 150 bp	650–750 Gb	1300–1500 Gb
Data Yield - 2 × 75 bp	325–375 Gb	650–750 Gb
Data Yield - 1 × 50 bp	105–125 Gb	210–250 Gb
Clusters Passing Filter (8 lanes per flow cell)	up to 2.5B single reads or 5B paired end reads	up to 5B single reads or 10B PE reads

Ex. QQ (HiSeq 3000/4000 Specifications, https://www.illumina.com/systems/sequencing-platforms/hiseq-3000-4000/specifications.html). During the normal and intended use of the HiSeq 3000 system, the flow cells have up to 2.5 billion clusters passing filter. According to the table above, the HiSeq 3000/4000 flow cells each have 8 lanes per flow cell. Moreover, clusters are generated on both the top and bottom surfaces of each lane. *See* Ex. RR (HiSeq 3000 System Guide, https://support.illumina.com/content/dam/illumina-support/documents/documentation/system_documentation/hiseq3000/hiseq-3000-system-guide-15066493-05.pdf) at 1 ("dual surface imaging"), 41 (describing data reading from the top and bottom surfaces of the flow cell). Therefore, each surface of each lane has up to approximately 156.25 million clusters passing filter.

35. During the normal and intended use of the HiSeq 4000 system, the flow cells have twice as many clusters passing filter: Each flow cell lane has up to approximately 625 million clusters passing filter. The HiSeq 4000 also generates data from clusters on both the top and bottom surface of each flow cell lane. *See* Ex. SS (HiSeq 4000 System Guide, https://support.illumina.com/content/dam/illumina-support/documents/documentation/system_documentation/hiseq4000/hiseq-4000-system-guide-15066496-05.pdf) at 1, 41.

36. The HiSeq X System Specification portion of Illumina's website provides a table depicting the output data for the HiSeq X system:

HiSeq X Instrument Performance Parameters*

	Dual Flow Cell	Single Flow Cell
Output per Run	1.6-1.8 Tb	800-900 Gb
Reads Passing Filter	5.3-6 billion	2.6-3 billion

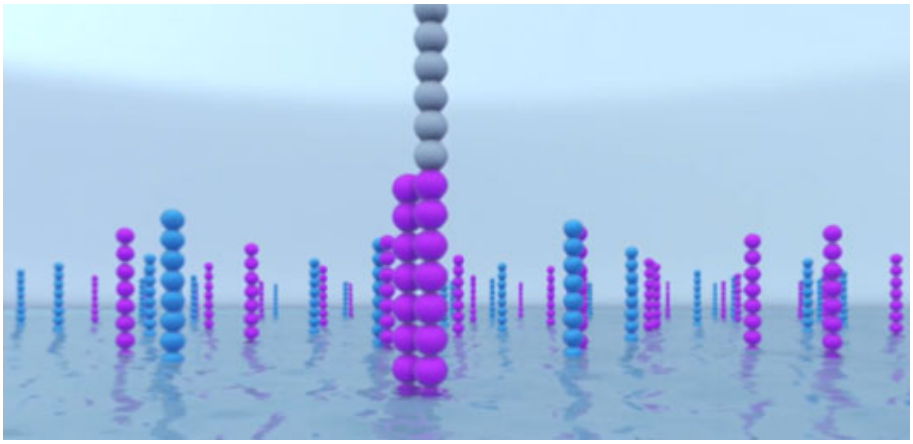
Ex. TT (HiSeq X Specifications, https://www.illumina.com/systems/sequencing-platforms/hiseq-x/specifications.html). According to the table above, use of a single flow cell with the HiSeq X system results in 2.5-3 billion reads (*i.e.*, clusters) passing filter. Like the HiSeq 3000/4000 flow cells, the HiSeq X flow cells have 8 lanes. Ex. UU (HiSeq X Frequently Asked Questions, https://support.illumina.com/sequencing/sequencing_instruments/hiseq-x/questions.html) ("The HiSeq X patterned flow cell contains eight lanes and has the same general dimensions as a HiSeq high-output flow cell."). Moreover, both the top and bottom surface of each flow cell lane is used

for sequencing. *See* Ex. II at 1, 40. Therefore, each surface of each flow cell lane has approximately 156.25-187.5 million clusters passing filter.

37. As discussed, each cluster is generally derived from a single sample fragment and thus comprises one DNA sequence. Thus, on information and belief and in light of the foregoing, during the normal and intended use of the HiSeq X and HiSeq 3000/4000 systems with their respective reagent kits, the HiSeq patterned flow cells comprise DNA arrays having more than 10^5 (*i.e.*, 100,000) different DNAs comprising genomic sequences (either on a per-lane or per-flow cell basis).

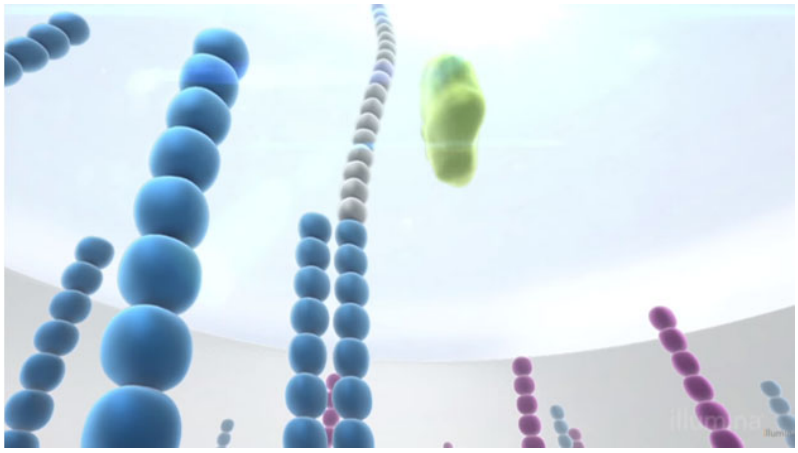
d. "wherein the DNA binding regions comprise oligonucelotides for binding the DNAs within the DNA binding regions"

38. During the intended use of the NovaSeq 6000 with any of the NovaSeq Reagent Kits, the DNA binding regions within the nanowells comprise oligonucleotides for binding DNA molecules. As described above, Illumina's marketing material states that "***[e]ach nanowell contains DNA probes used to capture prepared DNA strands for amplification during cluster generation***." Ex. OO at 1. This functionality is demonstrated in the NovaSeq System Explorer video, an excerpt of which is reproduced below:



Ex. KK; *see also* Ex. PP at 1:38. The excerpt above depicts an exemplary nanowell comprising oligonucleotides (blue and purple strands) immobilized on the array. These oligonucleotides are complementary to adapter portions on the genomic DNA (*i.e.*, purple section of purple and grey

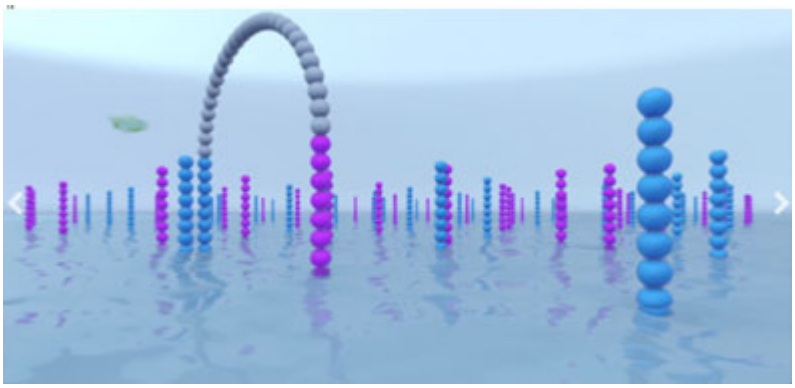
strand, center), as exemplified by the binding of one oligonucleotide to the adaptor of one genomic DNA strand. A similar process is depicted in the Patterned Flow Cell Technology video:



Ex. JJ at 0:55-1:01 (depicting an oligonucleotide (blue strand, center left) bound to a target nucleic acid fragment (blue and grey strand, center right), thereby demonstrating that the oligonucleotide binds to the DNA). Thus, the oligonucleotides in each nanowell of the NovaSeq Flow Cells comprise a sequence that is complementary to at least one of adaptors on the DNA strands that contain genomic DNA.

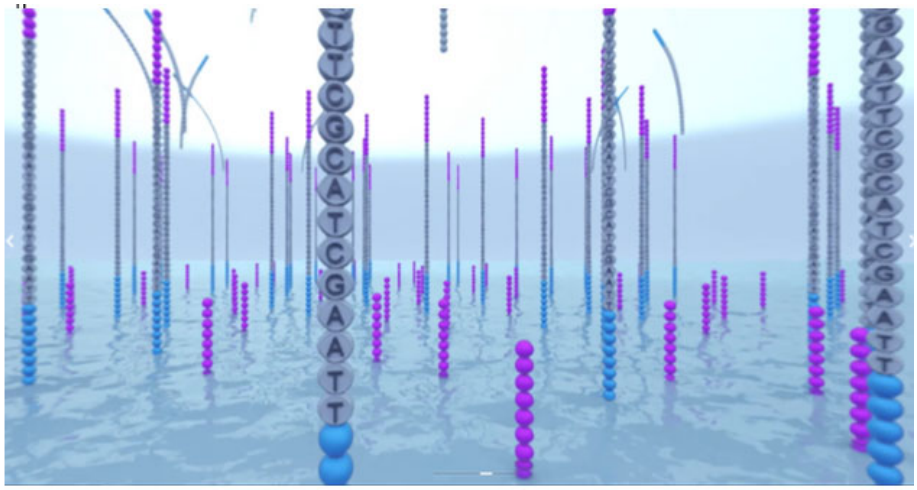
39. The normal and intended use of Illumina Library Preparation Kits, including, for example, the TruSeq™ DNA Nano and TruSeq™ DNA PCR-Free kits, results in adapters being appended to the genomic DNA fragments. *See, e.g.*, Ex. VV (TruSeq DNA Nano, https://www.illumina.com/content/dam/illumina-marketing/documents/products/datasheets/datasheet_truseq_nano_dna_sample_prep_kit.pdf) at 2; *see also* Ex. WW (Illumina Sequencing by Synthesis Video, https://www.illumina.com/company/video-hub/fCd6B5HRaZ8.html) at 0:31-0:46. On information and belief, one intended purpose of the immobilized oligonucleotides in the nanowells is to bind to these adaptors, which are complementary to the oligonucleotides, thereby binding to a genomic DNA fragment and sequestering it within the nanowell. As discussed above, on information and belief, there are two sets of oligonucleotides on any of the NovaSeq Flow Cells, with each set of oligonucleotides being complementary to at least one unique adaptor out of the two adaptors appended to the genomic DNA fragments.

40. Similarly, the oligonucleotides bind the DNAs via their adaptors during bridge amplification.



Ex. KK; *see also* Ex. PP at 1:43. As shown above, the DNA containing the genomic sequence folds over and the adaptor on the DNA (blue section of multi-colored strand) binds to the complementary oligonucleotide (blue, center left). This process is repeated during bridge amplification and the oligonucleotides continue to bind DNAs at each step throughout.

41. On information and belief, following sample preparation in the intended manner and prior to sequencing, at least part of each oligonucleotide for one set of oligonucleotides remains directly or indirectly attached to the surface of the flow cell, while the other set has been converted to template strands, which are also directly or indirectly attached to the surface of the flow cell. This is demonstrated in the NovaSeq System Explorer video, as shown in the excerpt below:



Ex. KK. The excerpt depicts one nanowell (*i.e.*, DNA binding region) of a NovaSeq 6000 instrument after sample preparation, and the nanowell comprises a plurality of single-stranded nucleic acid templates disposed on a surface (blue and grey strands) derived from one set of oligonucleotides. The excerpt also depicts the second set of oligonucleotides (purple strands). On information and belief, following sample preparation using the NovaSeq 6000 sequencer, the

NovaSeq Reagent Kits, and the Library Preparation Kits, DNA binding regions (*i.e.*, nanowells) of the flow cell comprise immobilized template strands (*i.e.*, strands comprising the DNA to be sequenced) and one of the two sets of oligonucleotide primers. Thus, on information and belief, following sample preparation using the NovaSeq 6000 sequencer, the NovaSeq Reagent Kits, and the Library Preparation Kits, the DNA binding regions comprise oligonucleotides for binding DNAs. Moreover, as a result of the amplification process, each of the immobilized template strands comprises an oligonucleotide that is covalently linked to the genomic sequence (*e.g.*, blue portion of the template strands above). Thus, these oligonucleotides, which are covalently bound to the DNA and are directly or indirectly attached to the flow cell, also constitute oligonucleotides for binding the DNA.

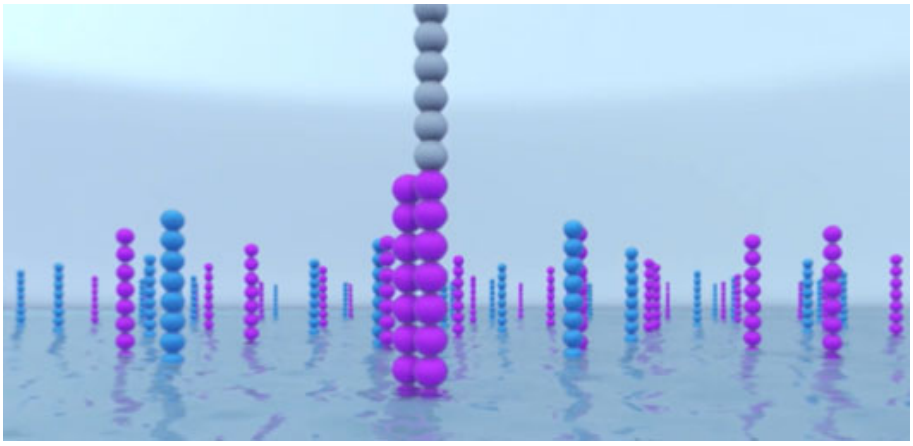
42. The "Patterned Flow Cell Technology" video depicts similar processes (*i.e.*, annealing to immoblized oligomers, generation of the template strand, and sequencing of the template). *See* Ex. JJ. As discussed above, Illumina's website states that the NovaSeq 6000, HiSeq X, and HiSeq 3000/4000 systems utilize patterned flow cell technology. Ex. BB. Thus, on information and belief, for the same reasons discussed above, the DNA binding regions of the patterned flow cells in the HiSeq X and HiSeq 3000/4000 Reagent Kits comprise oligonucleotides for binding DNAs.

e. **"and all of the DNA binding regions of the array comprise the same oligonucleotides"**

43. On information and belief, all of the DNA binding regions of the array comprise the same two sets of immobilized oligonucleotides. On information and belief, during sample preparation with any given Illumina sample preparation kit, each fragment of target DNA is appended with a set of two adapters. On information and belief, at least a portion of each of the two adapters appended to the sample DNA fragments is complementary to one of the sets of oligonucleotides, such that at least a portion of the first adapter is complementary to one set of oligonucleotides and at least a portion of the second adapter is complementary to the other set of oligonucleotides. On information and belief, the sequences of these complementary portions are identical for each fragment of DNA appended with adapters. Because these identical sequences are

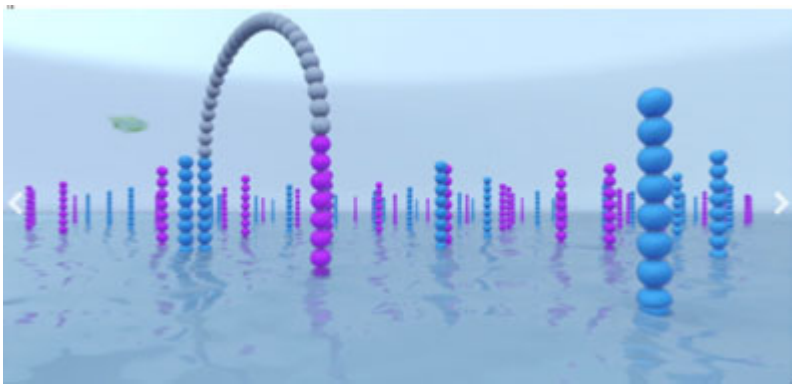
complementary to the sequences of the two sets of oligonucleotides in any given nanowell, each nanowell must use the same two sets of oligonucleotides. Therefore, on information and belief, all of the DNA binding regions of the NovaSeq Flow Cell arrays comprise the same oligonucleotides.

44. Illumina's NovaSeq System Explorer video shows the presence of the same nucleotides immobilized in each nanowell. For example, the NovaSeq System Explorer video depicts the process of cluster generation in an exemplary nanowell, in which the first step entails annealing target DNA fragment to the first set of immobilized oligonucleotides via the first of the two adapters:



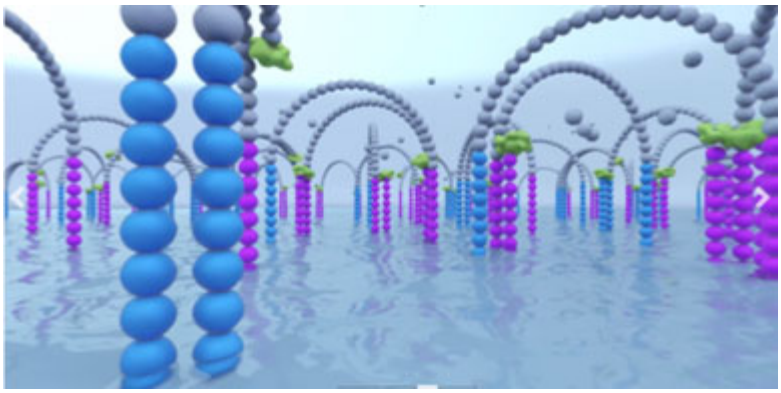
Ex. KK (depicting one of the oligonucleotides (*i.e.*, purple strand, center left) bound to a strand of DNA (*i.e.*, purple and grey thread, center right) by annealing to the adaptor portion of the DNA strand (purple portion of the thread, center right)); *see also* Ex. PP at 1:38. After strand capture, the complementary strand is generated using polymerase, thereby resulting in an immobilized template strand. On information and belief, the same process is intended to occur in any given nanowell on the NovaSeq Flow Cells.

45. The NovaSeq System Explorer video also depicts Illumina's modified "kinetic exclusion" method of bridge amplification.



Ex. KK; *see also* Ex. PP at 1:43. During this modified bridge amplification, the newly formed template strand forms a "bridge" by hybridizing (binding) to one of the second set of oligonucleotides via a portion of the second adaptor. For this process to work, at least a portion of one strand of the second adapter must be complementary to the second set of nucleotides. Following bridge formation, the complementary strand is generated by a polymerase, resulting in a second nucleotide template strand.

46. This process is repeated many times during cluster formation.



Ex. KK; *see also* Ex. PP at 1:50-1:53. These repeated cycles of bridge amplification are only possible if all members of the first set of oligonucleotides comprise an identical sequence and all members of the second set of oligonucleotides comprise an identical sequence. As discussed above, this process is intended to occur in each of the billions of nanowells on the NovaSeq Flow Cells, with each DNA fragment having adaptors comprising identical sequences for binding to the

oligonucleotides.[18] Therefore, on information and belief, all of the DNA binding regions of the array comprise the same two sets of oligonucleotides.

47. The "Patterned Flow Cell Technology" video depicts similar processes (*i.e.*, annealing to oligonucleotides and modified bridge amplification). *See* Ex. JJ. Thus, on information and belief, for the same reasons discussed above, all of the DNA binding regions on the patterned flow cells in the HiSeq X and HiSeq 3000/4000 Reagent Kits comprise the same two sets of oligonucleotides.

f. "and wherein the density of the DNA binding regions on the array is more than 100,000 per mm^2"

48. On information and belief, the density of DNA binding regions on the flow cell surface is more than 100,000 per mm^2. As seen in the diagram below, the NovaSeq patterned flow cell has a cluster density of roughly 1,775,000-2,070,000 clusters per mm^2.

Flow Cell Type	HiSeq Rapid Random	HiSeq Patterned	NextSeq Random	NovaSeq Patterned
Clusters / mm2 (P.F)	700–820 K	1255–1412 K	129–165 K	1775–2070 K
Yield (Gb)	125–150	800–900	100–120	850–1000
Pitch (nm)	-	700	-	624
Feature (nm)	-	500	-	360

[18] As discussed above, in the specially controlled kinetic exclusion process, bridge amplification occurs rapidly, thereby ensuring that a single DNA sequence makes up all or a dominant majority of the resulting template strands.

Ex. XX (Google Translation of Chinese NovaSeq Website, http://www.sohu.com/a/160407714_307557). As discussed above, during the intended use of the NovaSeq sequencer with a NovaSeq Flow Cell, only one cluster is generated per nanowell (*i.e.*, DNA binding region).

49. Additional public information provided by Illumina demonstrates that the NovaSeq Flow Cells have a higher density of nanowells than the flow cells used with the HiSeq X system, which themselves infringe the claimed density values.

> The redesigned ***NovaSeq flow cells improve upon patterned flow cells first deployed on the HiSeq X System***. Each flow cell contains billions of nanowells at fixed locations for even cluster spacing and uniform feature size. ***NovaSeq flow cells reduce spacing between nanowells, significantly increasing cluster density.*** Combining the higher cluster density with proprietary exclusion amplification clustering maximizes the number of nanowells occupied by DNA clusters originating from a single DNA template for a substantial increase in data output.

Ex. MM at 3. The Illumina specification sheet for the HiSeq X system states that cluster densities of 1,255,000 to 1,412,000 clusters per mm^2.

Table 2: HiSeq X System Performance Parameters[a]

Parameter	Specification
Output per Run	Dual flow cell: 1.6-1.8 Tb
Single Reads Passing Filter	Dual flow cell: 5.3-6 billion
Supported Read Length	2 × 150 bp
Run Time	< 3 days
Quality	≥ 75% of bases above Q30 at 2 × 150 bp
Supported Library Preparation	TruSeq DNA PCR-Free Library Prep Kit TruSeq Nano DNA Library Prep Kit

a. Specifications based on Illumina PhiX control library at supported cluster densities (1255–1412 K clusters/mm^2) on 1 HiSeq X System. Supported library preparation kit includes TruSeq Nano DNA Kit and TruSeq PCR-Free DNA Kit with 350 bp or 450 bp target insert size and HiSeq X Reagent Kit v2.5. The HiSeq X System was designed, optimized, and licensed for WGS. Other applications are not permitted.

Ex. YY (HiSeq X Specification Sheet, https://www.illumina.com/documents/products/datasheets/datasheet-hiseq-x-ten.pdf) at 2 (stating that the disclosed specifications were "at

supported ***cluster densities (1255-1412 K clusters/mm^2***" (emphasis added)). Thus, the patterned surface of the lanes of both the HiSeq X flow cells and the NovaSeq Flow Cells have a density of DNA binding regions that is more than 100,000 per mm^2.

g. **"more than 50% of the DNA binding regions in the array have multiple copies of one single DNA of said more than 10^5 different DNAs"**

50. During the intended use of the NovaSeq 6000 sequencer with the NovaSeq Flow Cells for DNA sequencing, more than 50% of the DNA binding regions (*i.e.*, nanowells) have multiple copies of one single fragment of genomic DNA. As discussed above, the specially controlled bridge amplification process (*e.g.*, Illumina's kinetic exclusion method) during cluster generation results in multiple copies of a single DNA within a nanowell. *See also* Ex. LL at 14 (stating that "[e]ach cluster is seeded by a single template DNA strand and is clonally amplified through bridge amplification until the cluster has ~1000 copies").

51. Illumina's NovaSeq 6000 Sequencing System brochure states that its "***clustering maximizes the number of nanowells occupied by DNA clusters originating from a single DNA template for a substantial increase in data output***." Ex. MM at 3. Thus, on information and belief, during operation of the NovaSeq 6000, more than 50% of the DNA binding regions in the NovaSeq Flow Cell array have multiple copies of one single genomic DNA fragment resulting in a sequence read.

52. Illumina's Patterned Flow Cell Technology video similarly shows DNA clusters formed within the nanowells on a flow cell surface. Ex. JJ at 1:26-1:34. On information and belief, during the normal and intended use of the HiSeq X and the HiSeq 3000/4000 systems, the DNA binding regions in these patterned flow cell arrays similarly have multiple copies of one single genomic fragment.

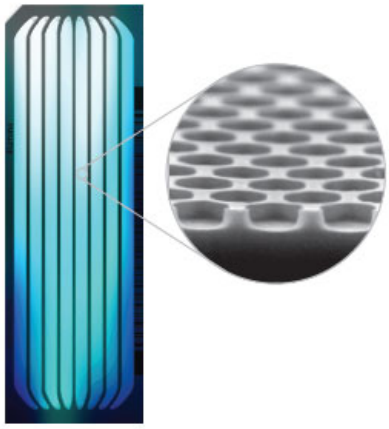
h. **"the sequence of the single DNA at each DNA binding region is not known"**

53. The sequence of the single DNA (*i.e.*, the sample fragment DNA) directly or indirectly bound to the surface of each nanowell during and/or following sample preparation is not

known. During sample preparation, the target nucleic acid is fragmented and these fragments are randomly scattered across the flow cell. Therefore, even if a sample contained known sequences prior to sample preparation, after fragmentation, flow cell loading, and cluster generation, the sequence of the DNA fragment in any particular cluster would be unknown. Moreover, the primary intended use for the NovaSeq 6000, the HiSeq X, and the HiSeq 3000/4000 is DNA sequencing (*e.g.*, whole genome sequencing, exome sequencing, etc.), which entails the use of unknown DNA samples (*e.g.*, individual human samples with their genomic variants).

i. **"and the array is not a bead array."**

54. The NovaSeq Flow Cells do not use a bead array. The patterned flow cells used in NovaSeq Reagent Kits are uniformly depicted in Illumina marketing material as a planar, textured surface, such as that shown below:



Ex. OO at 1. The '984 Patent describes "substantially planar" arrays as different embodiments than "bead arrays." *See* '984 at 27:10-28:67 (discussing various embodiments of arrays having "a substantially planar surface"); *cf* 32:5-57 (describing bead arrays as "another embodiment"). Thus, the arrays generated during the use of the NovaSeq 6000 system are not bead arrays.

55. For the same reasons, the arrays generated during the normal and intended use of the HiSeq X and HiSeq 3000/4000 systems are not bead arrays. For example, the Illumina website uses the same image to market reagent kits for the HiSeq X and HiSeq 3000/4000 systems. *See, e.g.*, Ex. DD; Ex. EE.

56. Accordingly, during the normal and intended use of the NovaSeq 6000, HiSeq X, and/or HiSeq 3000/4000 systems, arrays are generated that infringe at least claim 1 of the '984 Patent.

2. Infringement of Claim 2 of the '984 Patent

57. Claim 2 recites "The DNA array of claim 1, wherein the more than 10^5 different DNAs comprise human genomic sequences."

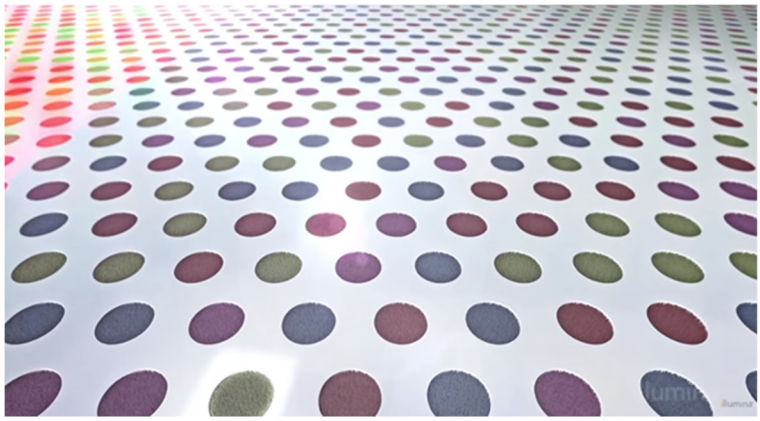
58. Illumina provides qualified methods for whole genome and exome sequencing, including protocols for human whole-genome and human exome sequencing. *See* Ex. MM at 3 (Table 2 noting that "[a]n Illumina Qualified Method is available" for whole-genome sequencing methods using the TruSeq™ DNA PCR-Free and Nextera DNA Flex library preparation kits). After sample preparation according to one of these methods, the nucleic acid templates comprise human genomic DNA sequences bound to an array (*i.e.*, directly or indirectly bound to the surface of the flow cell).

59. For example, when the NovaSeq 6000 system is used for sequencing of human DNA (such as, for example, human WGS), the more than 10^5 different nucleic acid templates that are sequenced are formed from a plurality of human genomic DNA sequences, as recited in claim 2 of the '984 Patent.

3. Infringement of Claim 3 of the '984 Patent

60. Claim 3 recites "The DNA array of claim 1 wherein more than 80% of the DNA binding regions in the array have multiple copies of the one single DNA."

61. As discussed above, the bridge amplification process results in multiple copies of a single DNA within a nanowell. On information and belief, cluster formation occurs in greater than 80% of the nanowells on a NovaSeq Flow Cell during intended use. For example, the Illumina Patterned Flow Cell Technology video depicts cluster formation in every nanowell on a patterned flow cell:



Ex. JJ at 1:26-1:34. Thus, Illumina's own marketing material depicts cluster formation in more than 80% of the nanowells on a patterned flow cell.

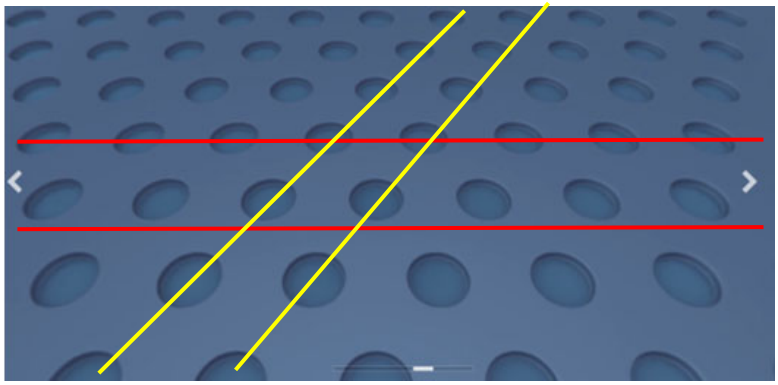
62. Furthermore, as discussed above in Paragraphs 50-52, Illumina claims to achieve extremely high numbers of clusters having at least a dominant majority of copies derived from one DNA fragment using simultaneous seeding and exclusion amplification.

63. Therefore, when the NovaSeq 6000 system is used during DNA sequencing, more than 80% of the DNA binding regions (nanowells) in the array have multiple copies of one single DNA (clusters), as recited in claim 3 of the '984 Patent.

4. Infringement of Claim 5 of the '984 Patent

64. Claim 5 recites "The DNA array of claim 1 wherein the DNA binding regions are arranged in a grid pattern."

65. The NovaSeq Flow Cells comprise a texture surface having nanowells in an ordered arrangement. For example, the NovaSeq System Explorer video depicts the surface of a flow cell:



Ex. KK (depicting the surface of a flow cell, and annotated with red and yellow lines indicating a rectilinear grid orientation of the nanowells). As seen from the foregoing excerpt, the nanowells on the NovaSeq Flow Cell surface are arranged in a rectilinear or hexagonal grid.

66. Moreover, the NovaSeq system identifies the signal coming from each nanowell by assigning positional values to each nanowell, corresponding to its position along two axes (*i.e.*, rows and columns). The NovaSeq 6000 System Guide states that cluster location files "contain[ ] the XY coordinates for clusters in a tile. A hexagonal layout that matches the nanowell layout of the flow cell predefines the coordinates." Ex. NN at 71. Thus, during their intended use, the NovaSeq flow cells have DNA binding regions that are arranged in a grid pattern, as required by claim 5.

67. The HiSeq 3000/4000 and HiSeq X systems similarly use an XY coordinate grid to determine the location of each cluster on the patterned flow cell. An Illumina Informatics brochure contrasts the grid pattern of such flow cells to the clusters generated on non-patterned flow cells:

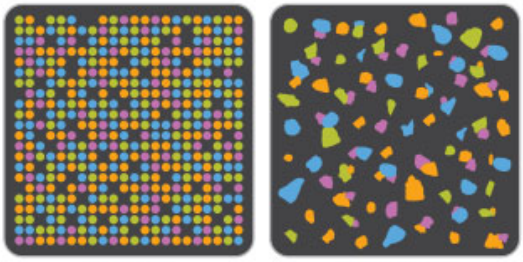


Figure 1: Patterned vs Nonpatterned Flow Cell Cluster Organization. A) Patterned flow cells have clusters with defined sizes, defined shapes, and ordered spacing. B) Nonpatterned flow cells have clusters with varied sizes, undefined shapes, and irregular spacing.

Ex. ZZ (Informatics Brochure on Clusters Passing Filter, https://www.illumina.com/content/dam/illumina-marketing/documents/products/technotes/hiseq-x-percent-pf-technical-note-770-2014-043.pdf). The brochure states that "[f]ive Illumina sequencing platforms currently take advantage of this advanced technology: the NovaSeq™ 6000, the NovaSeq 5000 system, the HiSeq X® System, the HiSeq® 4000 System, and the HiSeq 3000 System." *Id.*

68. Furthermore, the System Guides for the HiSeq X and the HiSeq 3000/4000 systems describes cluster location files that contain XY coordinates on a grid. *See* Ex. II at 39 ("For each tile, 1 cluster location file contains the XY coordinates for every cluster. Cluster location files are

the result of template generation."); *see also,* Ex. RR at 40; SS at 41. Thus, during their intended use, the HiSeq 3000/4000 and HiSeq X flow cells also have DNA binding regions that are arranged in a grid pattern, as required by claim 5.

B. Indirect Infringement of the Claims 1-3, and 5 of the '984 Patent

69. Illumina has induced and continues to induce infringement by their customers pursuant to 35 U.S.C. § 271(b). Illumina's customers directly infringe at least claims 1-3 and 5 the '984 Patent when they use Illumina's HiSeq X, HiSeq 3000/4000, and NovaSeq 6000 systems in combination with the recommended Illumina reagent kits, which comprise patterned flow cells. Illumina actively induces infringement by its customers by selling the HiSeq X, HiSeq 3000/4000, and NovaSeq 6000 systems, and their corresponding reagent kits and sequencing kits for use in a manner that infringes at least claims 1-3 and 5 of the '984 Patent, instructing its customers to use these products together in an infringing manner, providing qualification of the infringing methods, and by providing marketing materials, user guides, technical literature, and bioinformatics software applications to support its customers' infringing use.

70. On information and belief, Illumina has had knowledge of the '984 Patent since at least April 17, 2018 (the issue date of the '984 Patent) or shortly thereafter. On information and belief, Illumina is a sophisticated, multinational company that regularly monitors patent issuance in related fields, and therefore became aware of the '984 Patent upon issuance or shortly thereafter. On information and belief, Illumina acted with knowledge that the induced acts constitute infringement or willful blindness with regards to its customers' infringement of the '984 Patent. At the very least, service of this complaint provides Illumina with notice of the '984 Patent such that acts following such notice will be with knowledge that the induced acts constitute infringement.

71. In violation of 35 U.S.C. § 271(f)(1), Illumina has infringed and continues to infringe the '984 Patent by supplying all or substantially all of the components of patented invention from the United States to foreign countries. On information and belief, Illumina manufactures the accused flow cells in San Diego, California, and ships them from the United States to other countries, where such components are uncombined in whole or in part, in such manner as to actively induce the combination of such components outside of the United States in a

manner that would infringe the patent if such combination occurred within the United States. Illumina actively encourages such combination through promotional material, manuals, sales representatives, and technical support. Illumina knows that such combination constitutes infringement of the '984 Patent. Illumina's conduct infringes, including at least claims 1-3 and 5 of the '984 Patent, literally or under the doctrine of equivalents, and violates 35 U.S.C. § 271(f)(1).

72. On information and belief, Illumina has contributed and continues to contribute to infringement by their customers pursuant to 35 U.S.C. § 271(c). Illumina contributes to its customers' direct infringement by offering to sell, selling within the United States, or importing into the United States the HiSeq X, HiSeq 3000/4000, and NovaSeq 6000 sequencing systems, as well as their corresponding reagent kits, which comprise patterned flow cells specially designed and optimized for use in practicing claims 1-3 and 5 of the '984 Patent. Illumina sells these products with the specific intent that their customers use them in a manner that infringes at least claims 1-3 and 5 of the '984 Patent, and provides qualified methods and instructions directing their customers to perform infringing methods.

73. On information and belief, at least some of these systems and related kits, such as the NovaSeq Reagent Kits, the HiSeq 3000/4000 PE Cluster Kit, the HiSeq 3000/4000 Cluster Kit, the HiSeq 3000/4000 SBS Kit, and the HiSeq X Ten reagent Kit v2.5, do not have a substantial non-infringing use. Illumina sells these reagent kits to be exclusively compatible with one sequencer series (*e.g.*, NovaSeq 6000, HiSeq 3000/4000, or HiSeq X). These highly specialized products are not staple articles of commerce; they are specifically designed to be used in a manner that infringes the '984 Patent. On information and belief, Illumina acted with knowledge that the induced acts constitute infringement or willful blindness with regards to its customers' infringement of the '984 Patent.

74. In violation of 35 U.S.C. § 271(f)(2), Illumina has infringed and continues to infringe the '984 Patent by supplying from the United States its patterned flow cells that are especially made or adapted for use in the invention of the '984 Patent, and which are not staple articles or commodities of commerce. Illumina knows that these components are so made or adapted and intends that these components be used so as to infringe the'984 Patent. On

information and belief, Illumina manufactures the accused flow cells in San Diego, California, and ships them from the United States to other countries. Illumina intends that these components be combined in a manner that infringes the '984 Patent, and encourages such combination through promotional material, manuals, sales representatives, and technical support. Illumina's conduct infringes one or more claims of the '984 Patent, including at least claims 1-3 and 5, literally or under the doctrine of equivalents, and violates 35 U.S.C. § 271(f)(2).

75. On information and belief, Illumina's infringement of the '984 Patent has been willful and deliberate since learning of the issuance of the '984 Patent.

CLAIMS FOR RELIEF

COUNT 1

Infringement of U.S. Patent Nos. 9,944,984

76. CGI hereby re-alleges and incorporates by reference the allegations contained in Paragraphs 1 through 75 as if fully set forth herein.

77. Illumina and its customers have directly infringed and continue to directly infringe at least claims 1-3 and 5 of the '984 Patent pursuant to 35 U.S.C. § 271(a), literally or under the doctrine of equivalents, by using the NovaSeq 6000, HiSeq 3000/4000, and/or HiSeqX sequencers with their respective reagents kits, which include high density patterned arrays. Specifically, Illumina has used the accused systems in the United States in connection with research, development, installation, testing, and qualification activities. Illumina also uses the accused systems in the United States as part of the "FastTrack Sequencing" services that Illumina offers to customers. Illumina's customers have used the accused systems with their respective reagents kits in the United States in connection with DNA sequencing activities.

78. On information and belief, Illumina has had knowledge of the '984 Patent since at least April 17, 2018 (the issue date of the '984 Patent) or shortly thereafter. On information and belief, Illumina is a sophisticated, multinational company that regularly monitors patent issuance in related fields, and therefore became aware of the '984 Patent upon issuance or shortly thereafter.

79. On information and belief, with knowledge of the '984 Patent, Illumina has and will continue to actively induce others to infringe at least claims 1-3 and 5 of the '984 Patent in

violation of 35 U.S.C. §271(b) by, at least, causing, instructing, urging, encouraging, and/or aiding its customers to directly infringe at least claims 1-3, and 5 of the '984 Patent by using Illumina's NovaSeq 6000, HiSeq 3000/4000, and/or HiSeqX sequencers with their respective reagents kits, as detailed in Paragraphs 1 to 75, above.

80. On information and belief, Illumina has infringed and continues to infringe the '984 Patent by supplying all or substantially all of the components of patented invention from the United States to foreign countries. On information and belief, Illumina manufactures the accused flow cells in San Diego, California, and ships them from the United States to other countries, where such components are uncombined in whole or in part, in such manner as to actively induce the combination of such components outside of the United States in a manner that would infringe the patent if such combination occurred within the United States. Illumina actively encourages such combination through promotional material, manuals, sales representatives, and technical support. Illumina knows that such combination constitutes infringement of the '984 Patent. Illumina's conduct infringes, including at least claims 1-3 and 5 of the '984 Patent, literally or under the doctrine of equivalents, and violates 35 U.S.C. § 271(f)(1).

81. On information and belief, Illumina acted with knowledge that the induced acts constitute infringement or willful blindness with regards to its customers' infringement of the '984 Patent.

82. Illumina is liable for contributory infringement of the '984 Patent pursuant to 35 U.S.C. § 271(c). Specifically, Illumina has contributed to the infringement by its customers of the '984 Patent by selling and offering to sell within the United States NovaSeq 6000, HiSeq 3000/4000, and/or HiSeqX sequencers with their respective reagents kits for use in a manner that infringes the at least claims 1-3 and 5 of the '984 Patent, as described in Paragraphs 1 to 75, above. The aforementioned products, which are designed, supplied and supported by Illumina, constitute a material part of the claimed invention of the '984 Patent and are not a staple article or commodity of commerce suitable for substantial noninfringing use.

83. Illumina is liable for infringement of the '984 Patent pursuant to 35 U.S.C. § 271(f)(2). Specifically, Illumina has supplied in or from the United States at least patterned flow

cells that are specially made or specially adapted for use in the invention described in claims 1-3 and 5 of the '984 Patent. On information and belief, Illumina manufactures the accused flow cells in San Diego, California, and ships them from the United States to other countries. The patterned flow cells, which are designed, supplied and supported by Illumina, constitute a material part of the claimed invention of the '984 Patent and are not a staple article or commodity of commerce suitable for substantial noninfringing use. Illumina knows that these components are so made or adapted and intends that these components be combined with the accused sequencers outside the United States in a manner that infringes the '984 Patent, and encourages such combination through promotional material, manuals, sales representatives, and technical support.

84. On information and belief, Illumina's infringement of the '984 Patent has been willful and deliberate since learning of the issuance of the '984 Patent.

85. Illumina's infringement of the '984 Patent has injured CGI in its business and property rights. CGI is entitled to recovery of monetary damages for such injuries pursuant to 35 U.S.C. § 284 in an amount to be determined at trial.

86. Illumina's infringement of the '984 Patent has caused irreparable harm to CGI and will continue to cause such harm unless and until its infringing activities are enjoined by this Court.

PRAYER FOR RELIEF

A. A judgment that Illumina has directly and indirectly infringed the '984 Patent;

B. An order enjoining Illumina and its officers, directors, agents, servants, affiliates, employees, divisions, branches, subsidiaries, parents, and all others acting in active concert therewith from further infringement of the '984 Patent;

C. An award of damages pursuant to 35 U.S.C. § 284, including an award of costs, and pre- and post-judgment interest;

D. A declaration that Defendants' infringement was willful and deliberate, and an increase to the award of damages of three times the amount found or assessed by the Court, in accordance with 35 U.S.C. § 284;

E. A declaration that this case is exceptional pursuant to 35 U.S.C. § 285, and an award of attorneys' fees and costs; and

F. An award of such other and further relief as the Court may deem just and proper.

JURY DEMAND

Defendants hereby demand a trial by jury on all issues and claims so triable.

Dated: September 30, 2019

Respectfully submitted,

ARNOLD & PORTER KAYE SCHOLER LLP

By: */s/ Katie J.L. Scott*

Attorneys for Defendants

BGI AMERICAS CORP., MGI TECH CO. LTD., MGI AMERICAS INC., and COMPLETE GENOMICS INC.